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RAPID TRANSIT RATIONALE
INTERIM REPORT

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December 12, 1980

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Hamilton, Ontario

Attention: Dr. A.R. Gray, P. Eng.
Deputy Project Manager

Dear Sirs:

Subject: Hamilton-Wentworth
Rapid Transit Rationale - Task A-1

We are pleased to submit the attached report on the "Rapid Transit Rationale". This document completes Task A-1 of the Pre-Implementation Planning Program.

The report is a review of past studies and supporting documents. Based on the interest in a demonstration of ICTS technology, and on the Region's development objectives and transportation requirements, it can be concluded that there is adequate justification for proceeding with the Pre-Implementation Planning Program. The priority corridor, corridor boundaries, role of rapid transit and implementation timing are discussed.

Yours very truly

G.H. Johnston, P. Eng.
Planning Team Leader

GHJ:ct

HAMILTON-WENTWORTH RAPID TRANSIT PROJECT

TASK A-1: RAPID TRANSIT RATIONALE

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December, 1980

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INTRODUCTION

Since 1969 numerous studies have been undertaken relative to transit services in the Regional Municipality of Hamilton - Wentworth. Several of these studies specifically addressed the need for an improved rapid transit system connecting the City of Hamilton's downtown area with the area above the escarpment. The Official Plan of the Regional Municipality of Hamilton-Wentworth and the Draft Official Plan of the City of Hamilton both recognize the role that improved transit systems should play in support of the development objectives of the Region.

The Urban Transportation Development Corporation (UTDC) has spent several years developing advanced rapid transit technology and currently has a prototype Intermediate Capacity Transit System (ICTS) operating at its Transit Development Centre near Kingston, Ontario. The development of a Canadian industrial production capability and the ability to market the technology internationally requires a practical domestic application.

Hamilton was identified as an excellent location for the first revenue application because of its size and unique topography and with the support and backing of the Provincial Government, the Regional Municipality of Hamilton - Wentworth invited UTDC to undertake a pre-implementation study for a rapid transit system in the City of Hamilton.

The purpose of the Pre-Implementation Program is to define the system which best contributes to the achievement of the Region's goals and objectives. As an integral part of the program, Metro Canada's technical team is working together with consultants and with the municipality, to define an appropriate public involvement

program which is compatible and consistent with both the municipal and technical processes. This program is being carried out by consultants as members of the technical team. Similarly, environmental consultants have been retained by UTDC to perform the necessary environmental assessment.

In parallel with these activities, the technical team will assemble all relevant background material including base maps, soils and utilities data and information on existing and projected travel patterns and development conditions. This material will be compiled with municipal input concerning goals, objectives and constraints and with information on local attitudes. It will become the basis for the detailed definition of system requirements such as capacity and service characteristics, passenger comfort criteria and urban integration considerations. The documentation of these requirements will be produced for municipal review and approval. With these detailed requirements as the basis, the characteristics of ICTS will be assessed against the characteristics of other transit modes to confirm that ICTS is the most suitable mode.

As the requirements evolve, a series of alignment alternatives and a process for their evaluation will be generated by the technical team under municipal guidance. Once approved, a detailed evaluation will be carried out to produce a recommended alignment. The success of this work relies heavily on extensive public and municipal participation.

For the selected system, Metro Canada's technical team will refine the work done during the alignment evaluation activity. A system description will be prepared which will specify the final alignment and station locations and contain preliminary design characteristics, operating concepts, environmental studies, an urban integration study and an operating cost analysis. In addition, the technical team will begin design activities for the system's infrastructure and will prepare a top-level work program for the Implementation Program to serve as the basis for municipal approval to proceed.

Individual elements of the top-level work program prepared near the conclusion of the Pre-Implementation Program will be refined to provide for the successful implementation of the Hamilton Mountain Rapid Transit System.

The planning component of the Pre-Implementation Program consists of the following six major tasks:

- Rapid Transit Rationale
  - Review and document the transportation and urban planning rationale for corridor selection, corridor boundary, role of public transit and implementation timing.
- Generation of Feasible Alignment Alternatives
  - To identify twelve alternative alignments for the rapid transit facility.
- Analysis of Feasible Alternative Alignments
  - To analyze the set of twelve alternative alignments, and select a short list of approximately four alignments for more intensive evaluation.

- Refine Selected Alignments

  - Review evaluation methods and criteria and analyse in greater detail the short listed alternative alignments, and select one as the recommended alignment.

- Preliminary Design of Approved Alignment

  - Prepare a functional plan and provide a complete description of the integration of the system into the environment.

- Comparison of Alternative Modes

  - To demonstrate the ability of the ICTS technology to comply with the system requirements and to compare the performance characteristics of ICTS with those of other proven and available transit modes.

This report deals only with the Rapid Transit Rationale task which is detailed in the next section.

The Rapid Transit Rationale Task A-1 is basically a review of existing reports, documents and data. The Regional Official Plan of the Hamilton- Wentworth Region together with the background reports and the Capital Transportation Facilities Plan and the Draft Official Plan of the City of Hamilton were the basic documents used to obtain data, objectives and policies. Task A-1 includes the following activities:

- A review of all relevant traffic and transportation studies

- An update of all travel projections and analysis utilizing "Official Plan" development objectives and forecasts

- Preparation of base maps
- A review and confirmation of corridor selection
- Confirmation of the role of public transit in the selected corridor and the implementation timing
- Preparation of a report summarizing the analysis and findings of the transportation and urban planning rationale for rapid transit

SUMMARY

In August 1980, the Regional Municipality of Hamilton-Wentworth entered into an agreement with the Urban Transportation Development Corporation for the pre-implementation planning of a rapid transit system in Hamilton-Wentworth. A review of existing reports and documentation on transportation conditions, development objectives and technology demonstration is presented in this report. Confirmation of the priority corridor and its boundaries together with observations on the role of transit and implementation timing is included.

.1 Technology Demonstration

The Mountain corridor offers a unique opportunity to demonstrate the capability of Intermediate Capacity Transit System (ICTS) technology to provide service across a formidable topographic barrier, the Niagara Escarpment, in a corridor which encompasses a full range of urban development conditions including city centre and suburban development.

- The ICTS technology provides an opportunity to reduce dependence on the private automobile and fossil fuels, to reduce transportation pollution levels, and to stimulate higher density, more energy-efficient residential development.

- Federal government studies have concluded that the future development of the Canadian transit industry is dependent on development of systems and demonstrations of technology in revenue service.

- The Urban Transportation Development Corporation (UTDC) has developed a ICTS technology which has reached the stage where a revenue demonstration is required.

- The purpose of the revenue demonstration includes:

  - demonstration of technology and operational capability
  - advancement of prototype designs and tooling
  - provision of tooling and facilities for production
  - development of an advanced competitive industrial team in Canada's private sector, capable of worldwide export of transit systems
  - establishment of operational testing and manufacturing competence for revenue service.

- Revenue demonstration operations of ICTS technology will constitute the principal marketing tool for penetration of worldwide markets for ICTS.

- A strong argument can be made for implementation of ICTS in Hamilton-Wentworth before congestion problems develop in the road-based system.

- The early construction of ICTS would exhibit public sector confidence in the ability of the downtown area to attract new employment and development.

- Early construction would provide a strong transit-oriented development option for the Mountain corridor and the downtown area at a time when growth rates are expected to accelerate.

- A commitment to early construction would improve the decision making capabilities concerning the location of the proposed inter-city bus terminal, the proposed arena and the proposed new stadium.

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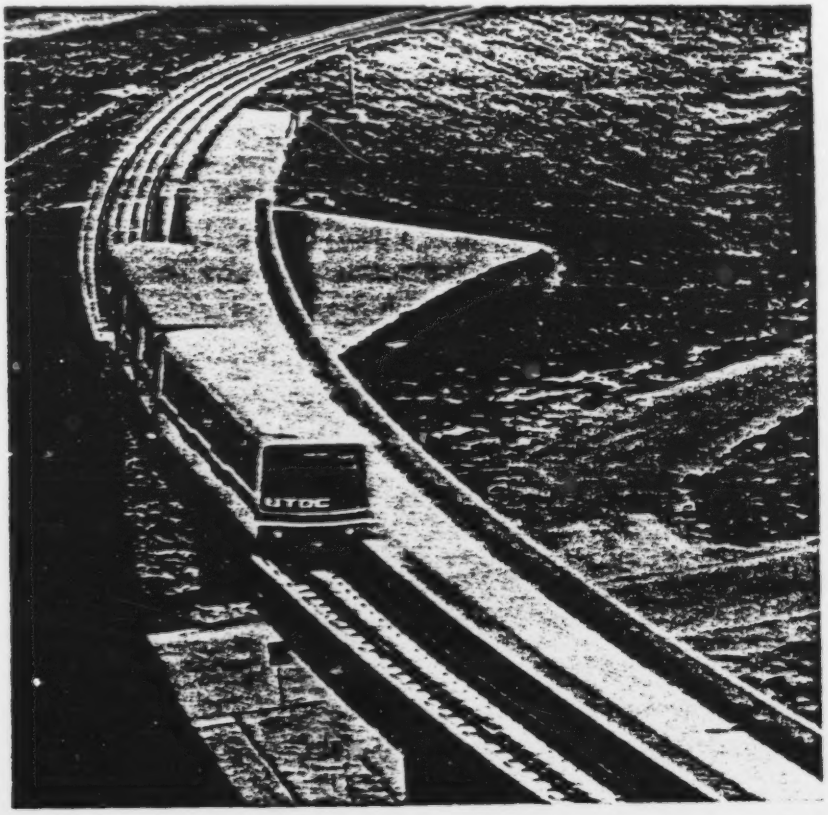


.2 Development Objectives

The Regional Official Plan includes a number of specific policies promoting the use of public transit and it projects a significant growth in population and employment in the Region by the year 2001.

- Approximately 80% of the total employment growth is expected to be in the service sector, which provides the opportunity to direct this growth to a highly transit-oriented location such as the downtown area.

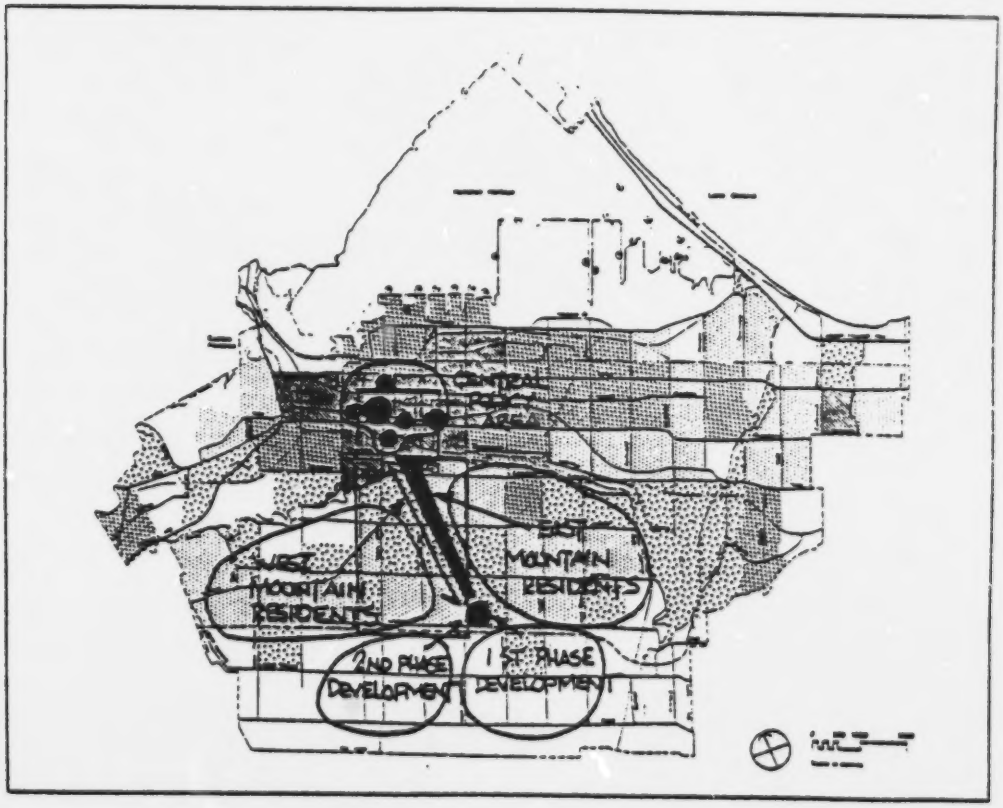
- The Regional Official Plan designates Downtown Hamilton as the Regional centre, and includes policies to promote its development as the primary multi-function office employment area and retail centre in the Region.

- Implementation of rapid transit to the downtown area will support the development objectives for the downtown area.

- The Regional Official Plan includes policies to encourage transit usage and reduce reliance on the automobile and to encourage transit oriented development in both the downtown area and new residential areas.

- The Regional Official Plan states that the urban transit system in the Region should be planned and operated in such a manner that the sub-regional centre on the Hamilton Mountain will be a focal point for transit service above the escarpment, with a major high speed transit connection between this centre and downtown Hamilton.

- Of the total population growth of 60 000 persons projected in the City between 1979 and 2001, approximately 65% will be above the escarpment.



.3 Transportation Service

A review of the data from previous transportation investigations reveals that:

- Two corridors with potential for rapid transit were identified among the six corridors reviewed, with the mountain corridor emerging as the priority corridor for implementation of rapid transit.

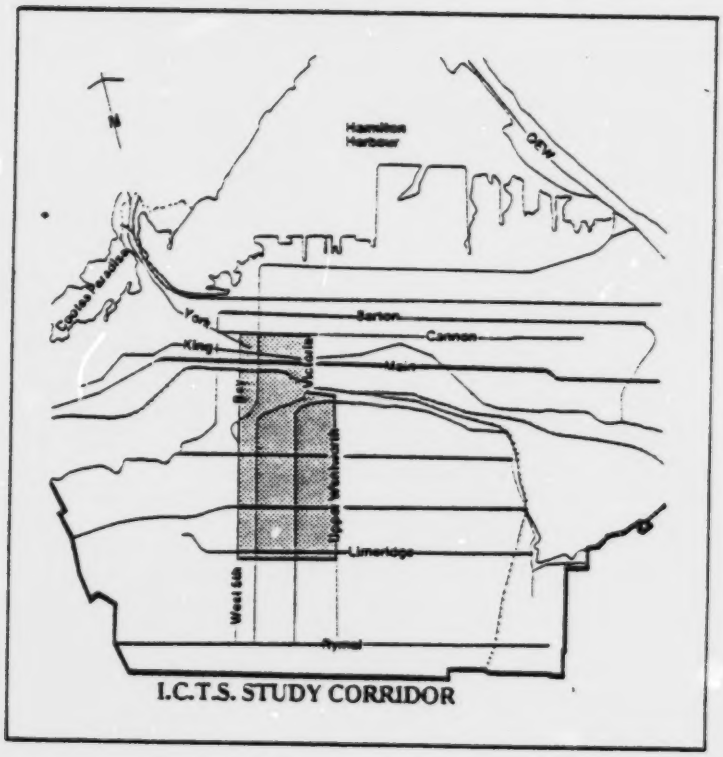
- Travel demand from the Mountain to the downtown area is concentrated on a few Mountain access routes immediately south of the downtown area. No additional major roads will be constructed across the escarpment, although some minor improvements may be made to the approaches to some access routes.

- Travel demand in the Mountain corridor is expected to exceed the practical capacity of the existing road system (automobiles plus surface buses) as early as 1986-1988. The future date is dependent on the actual rate of growth, and the modal split to transit (presently 26%).

- The practical capacity of surface bus transit operations is generally regarded as 6 000 passengers per hour in the peak direction (pphpd). If no road improvements are undertaken in the Mountain corridor, the transit travel demand (total person-trip demand less auto trip capacity) is projected to reach 6 000 pphpd by approximately 1992.

- This level of transit ridership would constitute an increase to 37% modal split to transit from the present level of 26%.

- Implementation of rapid transit would replace seven bus routes now using the Jolley Cut and would significantly reduce on-street bus movements in the central area, thereby contributing to better traffic operations.



I.C.T.S. STUDY CORRIDOR

.4 Conclusion

Based on the Province's interest in technology demonstration and on the Region's development objectives and transportation requirements it can be concluded that there is adequate justification for proceeding with the ICTS Pre-Implementation Planning Program.

If the rapid transit facility were to be considered solely on the basis of transportation requirements, implementation might be deferred until 1990 or later (assuming timely completion of likely minor road improvements). However, if technology demonstration and urban development objectives are of prime importance, and energy and air pollution considerations are given significant weight, implementation could proceed immediately. The positive benefits to the Regional Municipality of Hamilton-Wentworth for enhancing urban development through early operation of rapid transit, and the benefits to UTDC of a revenue-service demonstration of ICTS technology, seem indisputable.

1. BACKGROUND STUDIES

1.1 Rapid Transit in Hamilton

In 1979 the population of the City of Hamilton was 306 000 and was projected to increase to 367 000 by the year 2001. Approximately 65% of this population growth is projected to occur in the suburban residential areas above the Niagara escarpment, south of the Central Business District (CBD).[1]

In 1971, the Hamilton CBD employment was approximately 20 000 and is projected to increase to over 42 000 by the year 2001 with the major increase occurring in the service sector.[2]

Transportation facilities connecting the CBD to the mountain residential area are restricted to five major road corridors across the escarpment. There is no potential for expansion of these road facilities, with the exception of operational improvements on the approaches to some access routes.

Heavy reliance on transit to accommodate existing and projected future travel demands in urban areas is gaining widespread popularity for a number of reasons:

1) transit is capable of moving more people in a more cost-effective manner

2) superior energy efficiency of transit compared to private automobiles has been demonstrated

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1 Table 3.1
2 Table 3.1

3) there is a potential reduction in dependence on fossil fuels through the use of electric vehicles

4) transit generates less pollution than automobiles

5) transit reduces the requirement for investment in major road improvements, and attendent dislocation and disruption

6) transit reduces requirement for parking at trip destinations, particularly in the CBD

All of these general factors apply to Hamilton. In addition, however, improved transit service will be necessary to accommodate Hamilton's future travel demands because of the inability to provide sufficient additional road capacity to satisfy the demand by private automobile. This is particularly true in the CBD and across the escarpment where there is virtually no potential for additional road capacity.

Several studies since 1969 have examined the need for some form of rapid transit in Hamilton with capacity greater than that of surface bus systems. These studies are outlined below.

1.2 Report on Rapid Transit[1]

Investigations of rapid transit were initiated in 1969 when the Hamilton Transit Planning Committee carried out a preliminary assessment of the need for a rapid transit system in the Hamilton area. The results of this investigation indicated that the 1969 transit system was reaching capacity especially to and from the Mountain. It stated a requirement for an assured all weather facility between the Mountain and the Central Business District.

1. Report on Rapid Transit, Hamilton Transit Planning Committee, 1969.

1.3 Hamilton Area Rapid Transit Physical Feasibility[1]

In 1970 a study into the physical feasibility of building a rapid transit system up the mountain was conducted. Five basic forms of rapid transit were considered and evaluated. Six alternative alignments were developed and found to be physically feasible relative to the geophysical problems and constraints.

1.4 Recommended Priority Corridor Within The Basic Trunk Network[2]

In 1975 the Hamilton Transit Commission authorized work to proceed on the identification of the corridor that should receive first priority for the implementation of rapid transit. A number of corridors were evaluated from the point of view of demand, capacity, transportation alternatives, impacts and policies. The Mountain Corridor clearly emerged as the first priority corridor. The results of this investigation are contained in the report Recommended Priority Corridor Within The Basic Trunk Network,.

This report reviewed a scenario which projected existing development trends and two alternative 2001 land use scenarios, which, it was suggested could support rapid transit in the Mountain Corridor and West Corridor. The Mountain Corridor retained its priority after the analysis of all three scenarios. The report also recommended complementary land use and transportation policies to enhance transit usage. These policies were designed to promote higher development densities to restrict major road expansion in the Corridor and to increase control of parking in the Central Area.

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1. Hamilton Area Rapid Transit Physical Feasibility, Hamilton Transit Commission, 1970.

2. Recommended Priority Corridor Within the Basic Trunk Network, Hamilton Rapid Transit Development Programme, Phase III Stage I, September 1976

1.5 UTDC Studies in Hamilton

The Urban Transportation Development Corporation undertook several studies in Hamilton. A 1975 study, Hamilton Rapid Transit Network - A Discussion of Potential ICTS Routes in Hamilton investigated the potential of ICTS in Hamilton and the design features that would have to be incorporated in such a system to satisfy the transit requirements as well as the unique geographic features of the City.

In 1976 the UTDC/ICTS Urban Design Study examined the compatability of an elevated ICTS within various typical urban settings and identified operational capacities and initiatives which could improve the urban integration of the system.

The third UTDC study, ICTS Urban Design - Case One/Two, completed in 1977, identified and compared the differences between the application of ICTS and a Light Rail Transit System (LRTS) in the same environment and developed an approach for the design of an elevated ICTS system in representative urban environments.

1.6 Transportation Development Agency Studies

In 1976, the Federal Transportation Development Agency commissioned A Study of Existing Rights - Of - Way For Intermediate Capacity Transit Application in Canadian Cities: Hamilton to identify possible rights-of-way for ICTS, and to assess the future potential for applications in these corridors.

1.7 Regional Official Plan

The 1980 Regional Offical Plan and its supporting documents identify an important role for transit in the region and place a high priority on the mountain corridor.

The Regional Official Plan forecasts a 2001 population of 550 000 and a 2001 employment level of 290 000. The distribution of 2001 population and employment is similar to the Trends scenario suggested in the 1976 Recommended Priority Corridor Within The Basic Trunk Network report. The Regional Official Plan incorporates and expands on the transportation and development policies recommended in the 1976 Study, although the major residential density increases in the Mountain Corridor are not as extensive as recommended in the 1976 study.

The Regional Official Plan states a number of development objectives related to transportation systems which are compatable with and supportive of the Regional Development Pattern. It contains both general and specific policies giving public transit a high priority in the planning of new transportation facilities in the urban area to produce an integrated and balanced transportation system. It also calls for adequate transportation access to all areas and social and economic groups within the Region.

A two-level structure of commercial focal points is proposed in the Regional Official Plan with a major high speed connection between the primary focal point, downtown Hamilton, and the Mountain Sub-Regional Centre.

1.8 Draft Transportation Capital Facilities Plan (TCFP)

The Draft Transportation Capital Facilities Plan[1] prepared by the Regional planning staff states its objective is to link together the long term capital spending for transportation services identified in the Regional Official Plan and the short term implementation schedule of the Capital Budget Plan Process. The

1 Draft Transportation Capital Facilities Plan, Phase I and Phase II, Regional Municipality of Hamilton-Wentworth December 1979, June 1980.

link is established by the development of a technical priority evaluation in which capital works are identified and prioritized on the basis of interrelationships of land development and the transportation system.

On the basis of previous studies the Draft TCFP Report concludes that other than the mountain line, no other rapid transit line will be feasible within the planning horizon. The mountain rapid transit line must be implemented in order to accommodate development in downtown Hamilton and to encourage development on the Hamilton Mountain.

The Draft Transportation Capital Facilities Plan has been divided into two phases:

PHASE I which presents an inventory of the existing transportation system, identifies transportation issues outstanding in the Region today, presents a description of Regional development and presents the methodology for developing technical priorities.

PHASE II which presents the results of the travel demand analysis, the land development/ transportation analysis; identifies required transportation improvements or studies with estimates of the time at which implementation should occur; presents the technical priority and unit costs for various transportation projects; and finally identifies the importance of monitoring Regional Development.

1.9 Summary

The above mentioned reports have indicated a the future need for rapid transit and identified the Mountain Corridor as the priority corridor. The Regional Municipality and the City have established policies which recognize the need for rapid transit from the point of view of both transportation service and land development.

2. ICTS TECHNOLOGY DEMONSTRATION

2.1 Development of the ICTS Technology

2.1.1 Purpose of ICTS

In response to an identified future need in many cities for intermediate capacity transit systems, the Province of Ontario in 1975 embarked on a phased Intermediate Capacity Transit System (ICTS) development program. The purpose of this program was to produce a tested, advanced - technology, intermediate capacity transit system with substantially lower capital and operating costs than existing systems.

The Urban Transportation Development Corporation Ltd. (UTDC) has developed a prototype Intermediate Capacity Transit System (ICTS) at its Transit Development Centre near Kingston, Ontario. The ICTS is an essential element in the spectrum of modes required by transit operators, and now represents a technology in which Canada has the potential to achieve world leadership in applications and exports.

2.1.2 The Key Features of ICTS

The characteristics of ICTS have been established in response to a range of generally accepted transit requirements including the specific requirements for transit in the Mountain Corridor. As a result, ICTS is ideally suited to the Hamilton application.

ICTS has been developed for exclusive rights-of-way using short trains designed for high frequency operation on elevated guideways. The system can, however, be at-grade or underground. Safe and reliable high frequency operation is ensured through the use of an automatic train control system.

The design of elevated guideways for ICTS can be varied to achieve a high degree of integration within a range of urban environments, without affecting system performance. Elevated structures, including stations, are small in scale to minimize visual intrusion and to enhance the aesthetics of the system. With suitable urban design and landscape treatments they can be effectively blended into the urban environment.

Propulsion and braking for ICTS vehicles, are provided by a rugged Linear Induction Motor (LIM) rather than through the wheels as on conventional transit vehicles. High performance can be maintained under all climatic conditions since vehicles are not affected by wheel slip or slide. In addition to dramatically reducing wheel and rail wear, the LIM also enhances vehicle performance on steep grades, such as those likely to be encountered across the face of the escarpment. The LIM contributes to high quality service by permitting safe, reliable, high frequency operation.

ICTS vehicles operate on standard guage rail track. A unique steerable-axle suspension contributes to a high level of ride comfort, a further reduction in wheel and rail wear and, most dramatically, a low level of noise emission. The suspension design eliminates the squeal noise on curves, which is a characteristic of conventional rail vehicles. Additional noise reduction is achieved by using resilient wheels and continuously welded rail.

UTDC is approaching the conclusion of the major technology development phase of its ICTS program and must now transform these technological developments and skills into a productionized Canadian industrial capability. The first Intermediate Capacity Transit System is proposed for the Regional Municipality of Hamilton-Wentworth as a "Revenue Demonstration Project".

The orientation of the ICTS program has now shifted from research and development to fabrication of fully equipped revenue-class vehicles and operating system elements. The primary feature of the present phase is the transfer of advances in transit system technology state-of-the-art to the Canadian urban transit supply industry, and preparation in the industry to produce revenue service transit systems for both domestic and export markets.

2.1.3 Demonstration Purpose

UTDC has now developed the ICTS technologies to the point where passenger-carrying demonstrations of the system are required. The demonstration system would serve four purposes:

- demonstration of a technology and operational capacity to a world market place
- the advancement of prototype designs and tooling and the development and refinement of production designs and provision of production tooling and facilities
- the development of an advanced competitive industrial team in Canada's private sector capable of exporting transit systems to all countries of the world
- the establishment of operational testing and manufacturing competence for revenue service

The demonstration system would provide a showcase for Canadian transit technology and industrial capability. Revenue demonstration systems in major Canadian cities will form the primary market tools for an export marketing program, and will present concrete illustrations of Canadian industrial and technological capabilities.

2.1.4 The Canadian Urban Transit Industry

The Canadian urban transit equipment industry has the potential to become a world leader in the supply of transit equipment and systems. As described in the 1978 Department of Industry Trade and Commerce (DITC) discussion paper The Urban Transportation Equipment Industry in Canada, the development of the industry has occured largely in the last decade, and has been based on: -

- domestic and foreign market opportunities
- provincial initiatives
- expressed federal interest

Research and development during this period, oriented both to full systems and to sub-systems and components, have provided Canada with a position in transit systems development and a world lead in some product areas. The recent industry history is that most of the successful international transit component programs have evolved as part of a larger system development activity. It is now becoming clear that advances in both components and in full systems in future years will be, for the most part, derived from major systems development programs.

In its report, DITC finds that

> "the potential for further development of the Canadian urban transportation systems and equipment capability is excellent ... but (the industry's commercial) success is dependent upon its ability to penetrate the domestic market and thus demonstrate its systems capability in revenue service. The importance of a systems capability and the demonstration of that capability in the domestic market cannot be over-emphasized. Without it the companies now forming the Canadian industry sector must inevitably reduce their activity to exploitation of domestic market opportunities under foreign licence. With it, the Canadian share of the world market can continue to increase. It is essential that domestic governments, Provincial and Federal, as the only customers for transit equipment

and as the primary benefactors of transit technology advances, provide the research facilities, demonstration capability, and financial climate necessary for the transit industry to achieve this full technical and industrial potential."

2.1.5 The ICTS Industrial Team

An important component of the demonstration phase of the ICTS Development Program is the creation of a Canadian Industrial Team possessing all of the skills and expertise required to produce high technology transit systems for the domestic and international markets. One of the objectives of the ICTS Development Program is to involve as many Canadian suppliers and sub-contractors as possible, in order to maximize industrial participation in the program and to develop a strong and internationally competitive industrial base. The record of the Urban Transportation Development Corporation Ltd. (UTDC) during the past four years shows that approximately 95% of all its expenditures have been sub-contracted, and that hundreds of firms across Canada have participated commercially in UTDC programs such as ICTS. This group of companies illustrates the Industrial Team concept and could represent the core of a potential demonstration system team. Metro Canada Limited is the agency established by UTDC to represent the Industrial Team for the ICTS demonstration project in Hamilton and, ultimately, for future ICTS implementations.

2.1.6 Demonstration Location

UTDC has undertaken as an integral part of its ICTS technology development program, a series of application studies. The purpose of these studies was to test the ICTS system capabilities against the real-life operational requirements of transit system scenarios developed on the basis of Canadian municipalities' assessments of their future transportation needs and plans. The findings of the applications studies were used as a continuous check on the ICTS

technology design to ensure that technical definition always conformed to real market needs and opportunities.

The studies revealed that the ICTS system was appropriate in a number of applications. In particular, in Ontario the studies proved that ICTS was especially suited to the application in Hamilton's Mountain Corridor.

The Mountain Corridor offers the unique opportunity to demonstrate the capability of the ICTS technology to provide service across a formidable topographic barrier, the Niagara Escarpment, in the midst of an urban environment. The corridor also includes a full range of urban development conditions which constitute a variety of constraints and opportunities for the design of ICTS. These include:

Central Business District	- large scale urban development - major traffic arteries - limited right-of-way widths - railway crossing - potential routes in railway corridors - requirements for interface with surface bus routes - potential for integration with existing and proposed development.
Escarpment	- prolonged sections at steep grades - limited route alternatives and right-of-way - possible tunnel sections and stations - difficult geotechnical conditions - environmentally sensitive areas
Mountain (above escarpment)	- low density residential development - some sections of strip commercial and highway commercial development

- shopping centre opportunities
- limited areas of high density development
- limited arterial road rights-of-way
- requirement for provision of feeder bus and auto kiss-n-ride interface
- potential for provision of commuter parking

The future need for a high capacity transit line has been substantiated in the many transportation reports which have been produced since 1969 and is reflected in the Regional Official Plan which states that

> "a transit system with increased transit capacity receive a high priority in transportation planning in the urban areas of the Region, especially in the corridor connecting downtown Hamilton to the sub-regional centre on the Hamilton Mountain"[1]

As a result of these studies both the Corporation of the City of Hamilton and the Regional Municipality of Hamilton-Wentworth in January of 1979 requested the Minister of Transportation and Communications to proceed with a rapid transit study.

---

1 Official Plan Regional Municipality of Hamilton-Wentworth 1980, Sec 9.3.8 pg 77

2.2 The Plan Of Action

Metro Canada Limited, with cooperation with the Region of Hamilton-Wentworth developed a phased program leading to the commencement of passenger-carrying operation of an ICTS facility in the Hamilton Mountain Corridor. Metro Canada proposes to undertake and coordinate all aspects of the engineering, design, construction and management of the project. Since it is recognized that a high degree of local involvement at the political and technical levels is vital to the successful completion of the project, the program has been structured to provide key decision points for the municipal governments. A Technical Committee representing appropriate municipal and provincial departments and local organizations will be integral to the project management process. Throughout the project, Metro Canada's technical team will ensure that local consultants, contractors and businesses are made fully aware of opportunities for their participation as these opportunities arise.

The Pre-Implementation Program, represents all work which must be completed prior to the commencement of implementation activities. The Pre-Implementation Program includes public involvement, definition of requirements, environmental assessment, and alignment selection. Certain design tasks will also be initiated during this phase which is estimated to require approximately 12 months to complete. Following a decision to proceed, implementation activities through to the commencement of revenue operation will account for a minimum of 4 years. In both cases, the estimates may vary according to the duration of the review and approval processes.

Metro Canada Limited is undertaking the Pre-Implementation Program as a self-contained study which will provide the municipality and the public with all inputs necessary prior to the complex and important decision to proceed with the implementation of a new transit system.

3. GROWTH AND DEVELOPMENT

3.1 Introduction

Growth forecasts for the Regional Municipality of Hamilton-Wentworth have recently been defined for the 1980-2001 planning period by the Regional Official Plan. Several significant changes in the future characteristics of the Region's growth are implicit in these projections. These changes include a turn around of existing slow growth population trends, considerable improvements in the diversity of employment, and increased emphasis on the development in existing urban areas.

To date several sizeable commitments have been made to the achievement of these changes. Rapid transit, has so far however, been regarded primarily in the role of serving growth in the latter half of the planning period rather than in the role of initiating or stimulating change. To date a full assessment of possible development benefits associated with the early implementation of rapid transit has not been undertaken.

In addition to describing the overall Regional growth objectives and the characteristics of its distributon, this report highlights those factors which support the changes necessary to meet the growth objectives.

3.2 Regional Growth

3.2.1 Present Trends and Planned Objectives

The Draft Transportation Capital Facilities Plan (TCFP) effectively summarizes the present growth situation and plans for future growth. It states that at the present time, the Region of Hamilton-Wentworth is undergoing very slow growth. This slow rate of growth results from a number of local, national and global

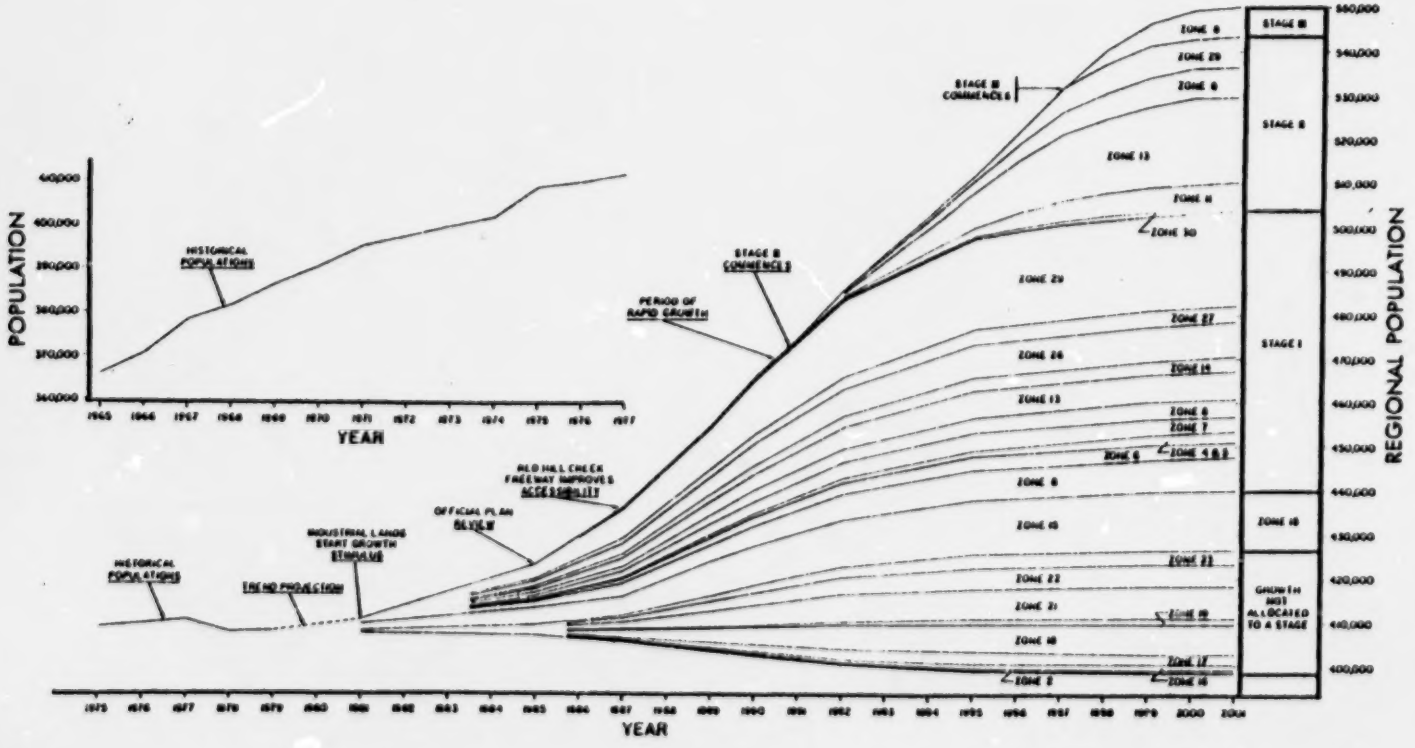
influences. If the Region is to realize Official Plan population and employment growth projections of 550 000 residents and 290 000 jobs by the year 2001, significant changes to factors influencing growth must be implemented at the local level.

The location of the Region in Central Ontario would suggest that the opportunity to attract a greater share of the Provincial population growth to the Region and City of Hamilton exists provided that adequate employment opportunities can be attracted. Although no employment information is available for the Region alone since the 1971 Census, information for the Hamilton Census Metropolitan Area[1] (CMA) indicates a total employment growth of 83% from 1971-1979.[2] The City of Hamilton estimates that a large percentage of this growth has occurred in the City itself.[3] As noted in Section 3.2.3, there is a substantial commitment to attracting more employment to the Region and City.

3.2.2 Projected Growth Rate and Staging

Figure 3.1 shows the target growth curve contained in Phase 2 of the Draft Transportation Capital Facilities Plan. This curve reflects the regional population and employment forecasts based on natural increases (80%) and net migration (20%). Inherent in the forecasts are the current social and economic influencing factors. (i.e. increase in percentage of working age population and female participation in the work force). Since the primary driving force for growth has been identified as the development of lands providing job opportunities, it is logical to assume that as these

1. CMA includes the Town of Grimsby, the City of Burlington and the Hamilton-Wentworth Region.
2. City Draft Official Plan Appendix D4.
3. City Draft Official Plan, Appendix D4.



NOTE: ZONES AND ZONE NUMBERS EQUIVALENT TO DEVELOPMENT AREAS AS SHOWN IN FIGURE 3.2

Regional Population Growth Curves 1979 - 2001

by Development Area

Source: DRAFT
Transportation Capital Facilities Plan, Phase 2, June 1980

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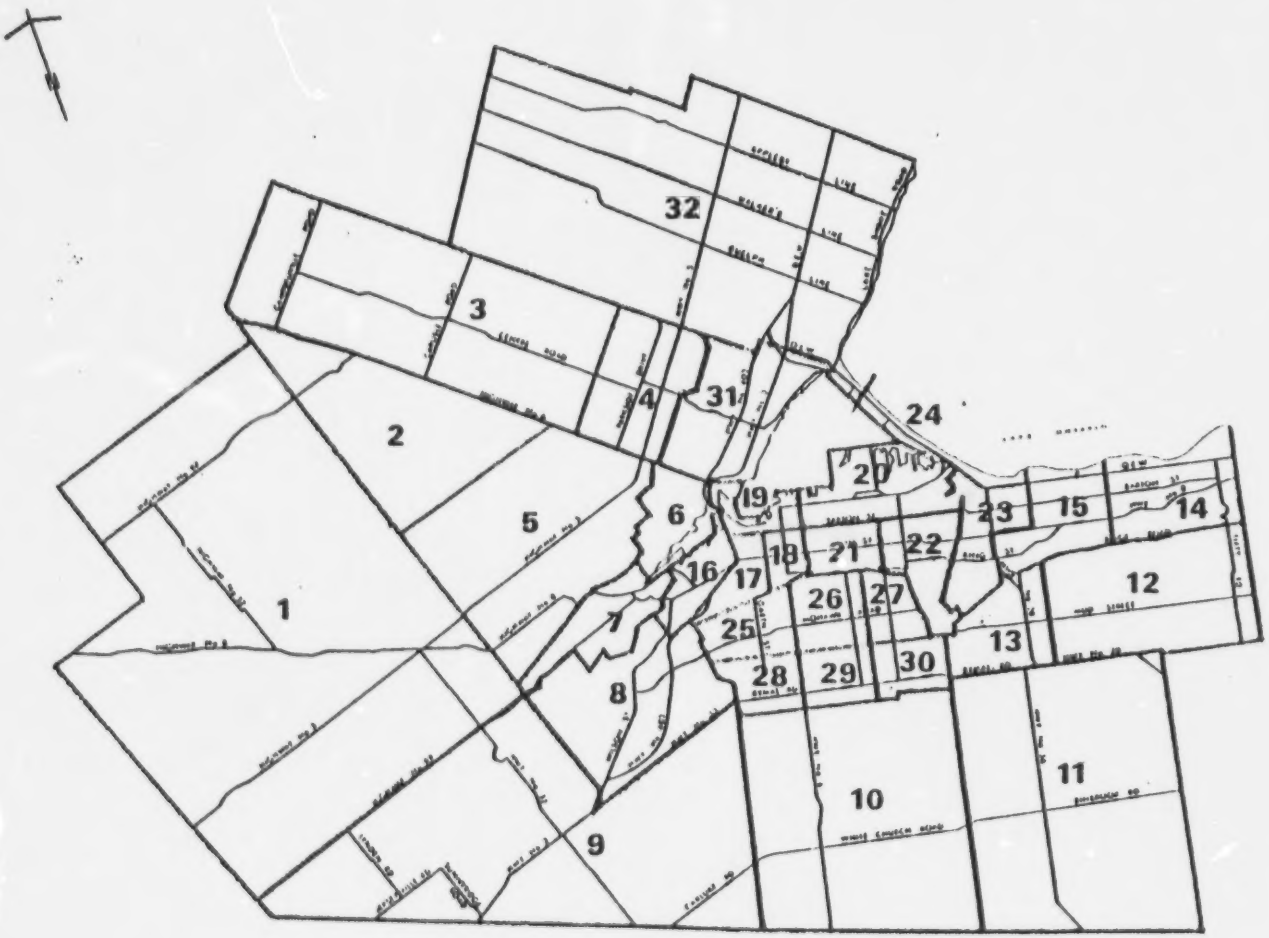
Hamilton-Wentworth Rapid Transit Project

Figure 3.1 Rapid Transit Rationale

Marshall Macklin Monaghan
Hatch Associates Ltd.
Barton Myers Associates

November 1980



Development Areas

Source : Report No. 5
External Travel
Impacts Study
H-W Region

Legend

Zonal Boundaries

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Hamilton-Wentworth
Rapid Transit Project

Figure 3.2 Rapid Transit Rationale

Marshall Macklin Monaghan Ltd.
Hatch Associates Ltd.
Barton Myers Associates

November 1980

lands approach their full development, then growth related to this set of stimuli will begin to taper off. The final stages of development in these lands will be fairly slow. However Regional growth is anticipated to continue. The population growth curve reflects anticipated employment opportunities in Hamilton-Wentworth over the next twenty years.

The curves are premised on the Region being successful in attracting growth.

Figure 3.2 indicates the development areas which are identical to the zone numbers referred to in Figure 3.1. Figure 3.3 illustrates the staging of this development.

3.2.3 Public Sector Commitment to Growth

The benefits of public support for planned growth has been recognized by the Region and other levels of government.

> "In 1970 the City, in a partnership with the Federal and Provincial governments, began a major downtown 'Civic Square Redevelopment Project' in order to revitalize the central area. The project, much of which has been completed, includes the Jackson Square shopping mall, Hamilton Place, the Library/Farmers Market, Art Gallery, Convention Centre, and several office towers. However, private re-development has been slow to materialize, and there is some indication that some sections of downtown Hamilton have been deteriorating in recent years".
>
> "To co-ordinate public and private actions for the growth of downtown Hamilton, the Central Area Plan Advisory Committee (CAPAC) was formed in 1978. CAPAC, consisting of representatives from citizens groups, community organizations, businessmen, and ward politicians, developed a Central Area Plan."[1]

This plan identifies actions necessary to improve the attractiveness of the downtown as a business location.

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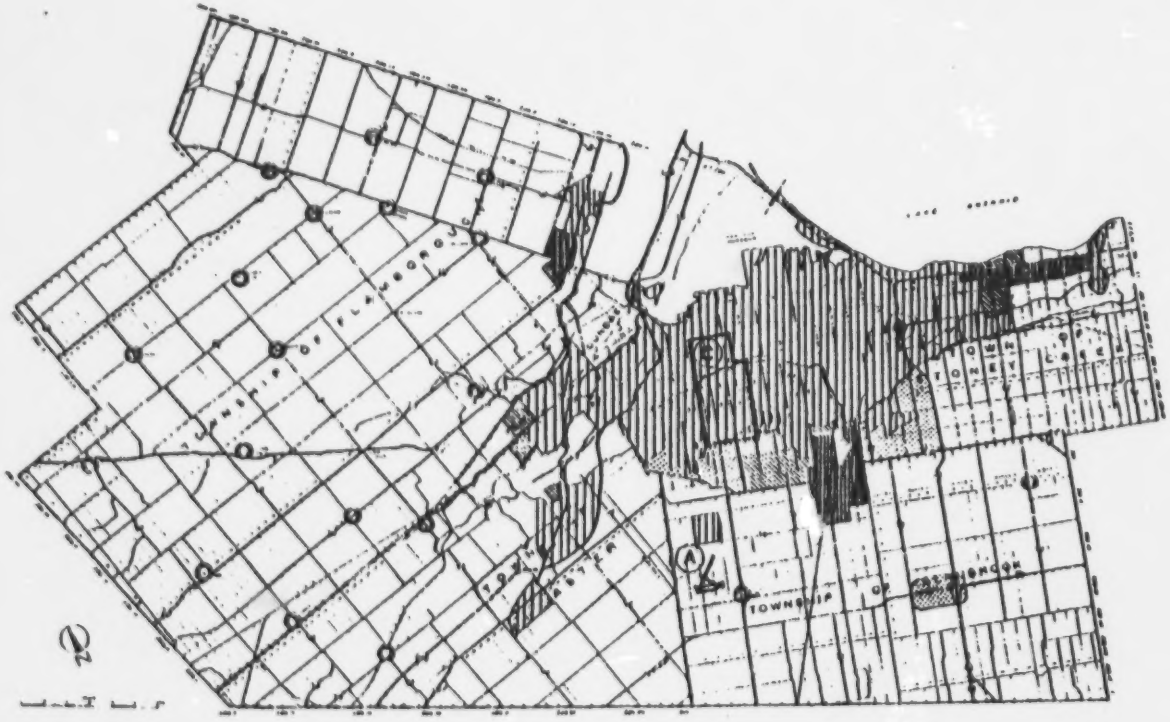
1. City of Hamilton Draft Official Plan, Appendix C, August 1980.



Staging of Development Concept

Source H-W Official Plan
June 1980

Legend

Stage 1

- Existing Development
- New Residential and Related Uses
- Industrial-Business Parks
- Regional Centre
- Sub-regional Centre
- Airport
- Mountain Corridor

Stage 2

- New Residential and Related Uses

Stage 3

- New Residential and Related Uses

- Rural Settlements

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Hamilton-Wentworth Rapid Transit Project

Figure 3.3 Rapid Transit Rationale

Marshall Macklin Monaghan
Hatch Associates Ltd.
Barton Myers Associates
November 1980

To provide further support for these actions, and to promote economic development in the Region generally, Section 14.7 of the Regional Official Plan establishes policies:

> "To develop a Regional Business Promotion Program which encompasses all sectors of the economy, but places particular emphasis on those sectors and industries with the greatest potential for growth."

and

> "To actively pursue an industrial land banking responsibility...".

To make the quality of industrial land competitive with surrounding areas, the Region and local municipal governments have committed themselves to the provision of industrial support facilities, primarily roads, over the next four years. Initial capital outlays have been directed toward roads for the industrial infrasturcture with rapid transit called for to serve later stages of growth.

3.3 Population Growth Distribution and Characteristics

3.3.1 Recent Trends

Table 3.1 and Figure 3.4 show the recent changes in population distribution from 1971 to 1979 for the Hamilton-Wentworth Region.

Population has declined in older urban areas due to aging of stable households resulting in smaller household sizes and increases in non-family households. Development of new areas on the Hamilton Mountain, in Stoney Creek and Flamborough have offset this loss and have been responsible for the Region's small overall growth during this period.

3.3.2 Projected Growth to 2001

The Regional Official Plan projects a population increase of 142 000 in the Region by the year 2001[1]. Figure 3.4 illustrates the distribution of the 2001 population as forecast by the Regional Official Plan. The Mountain area in the City, together with the flanking Ancaster and Saltfleet (in Stoney Creek) developments account for approximately 88 000 or 62% of the total population increase in the Region. These areas comprise the southern catchment area for rapid transit in the Mountain Corridor. By 2001 they are expected to contain approximately 218 000 residents or 40% of the Region's population.

The Central Policy Area, the northern end of the Mountain Corridor, is expected to receive 2 800 new residents in the CBD plus a large percentage of the 25 000 increase allocated to the rest of the area below the escarpment.

The only other significant population growth (16 000) is in the north western part of Stoney Creek.

3.3.3 Residential Densities and Concentrations

Figure 3.5 shows the approximate present net population densities of Hamilton's residential uses. Figure 3.6 identifies the two major residential development sectors where new development or redevelopment is expected to occur.

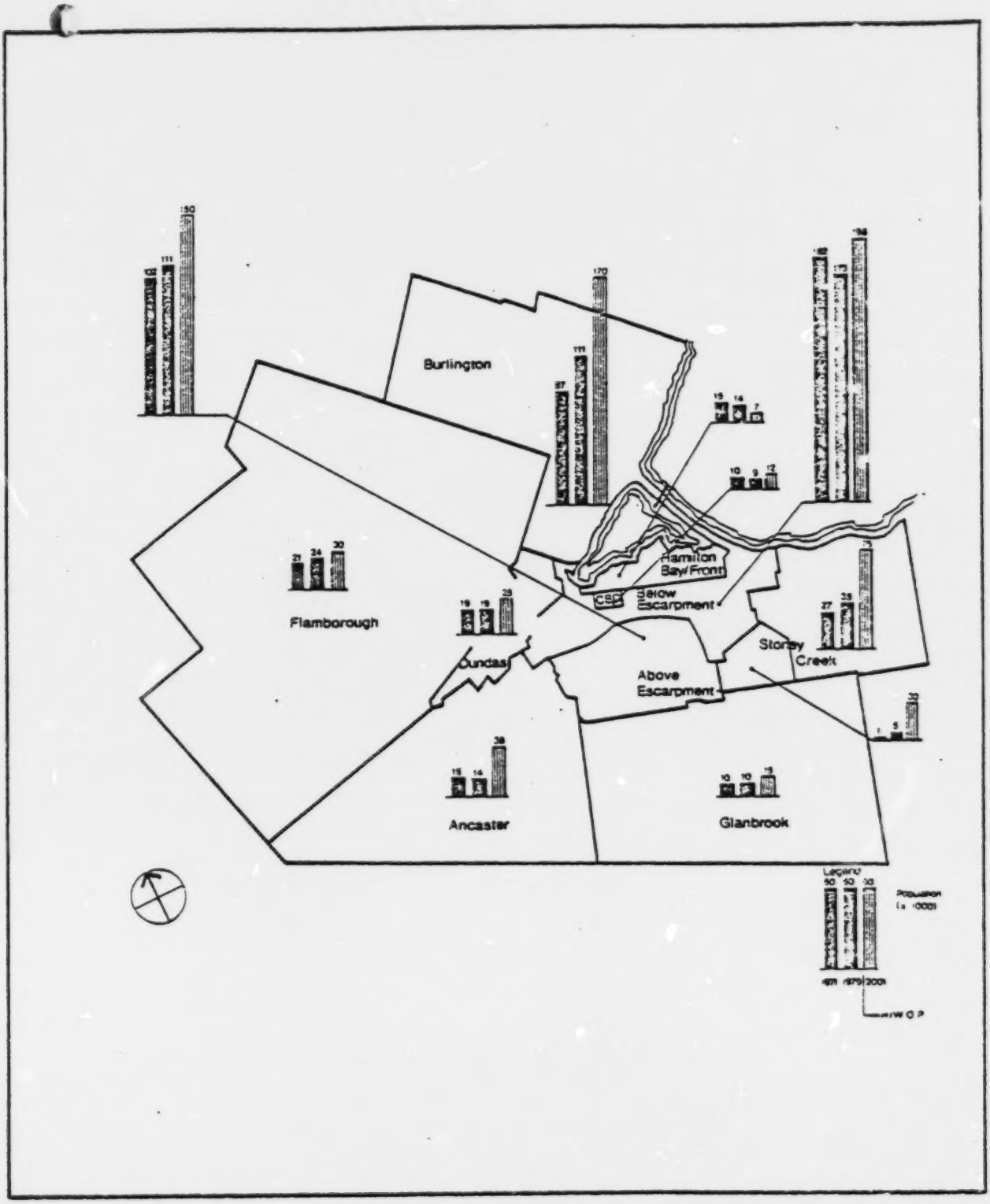
In the Central Policy Area, the location of the Region's highest population densities, some residential population will be lost due to conversion of residences to other uses or through redevelopment. The Proposed Central Policy Area Plan for this area suggests the construction of 31 800 new units for an estimated 60 900 residents

1. Table 3.1.

TABLE 3.1 POPULATION AND EMPLOYMENT PROJECTIONS[1]

	POPULATION					EMPLOYMENT			
	1971	1979	1986	2001	1979-2001	1971	1986	2001	1971-2001
CBD[2]	10 000	9 200		12 000	2 800	20 000		42 400	22 400
BAY FRONT	15 000	13 800		7 000	-6 800	45 000		49 500	4 500
REST BELOW ESCARPMENT	174 000	172 500		197 800	25 300	56 000		98 200	42 200
ABOVE: ESCARPMENT	102 000	110 900		150 200	39 300	14 000		38 800	24 800
HAMILTON TOTAL	301 000	306 400	318 000	367 000	60 600	135 000	158 300	228 900	93 900
FLAMBOROUGH	21 000	24 000	25 000	30 000	6 000	3 400	4 800	6 500	3 500
DUNDAS	19 000	19 200	20 400	25 000	5 800	4 600	5 150	6 600	2 000
ANCASTER	15 000	14 200	16 700	38 000	23 800	2 000	2 650	12 000	10 000
GLANBROOK	10 000	9 900	9 800	14 600	4 700	1 500	1 400	7 000	5 500
STONEY CREEK	27 000	34 600	39 400	75 400	40 800	6 800	12 400	29 000	22 200
REGION TOTAL	393 000	408 300	429 300	550 000	141 700	153 300	184 700	290 000	136 700

1. Source: Regional Planning Department
2. CBD is from C.N.R. Railway to Main Street between Wellington Street and Queen Street



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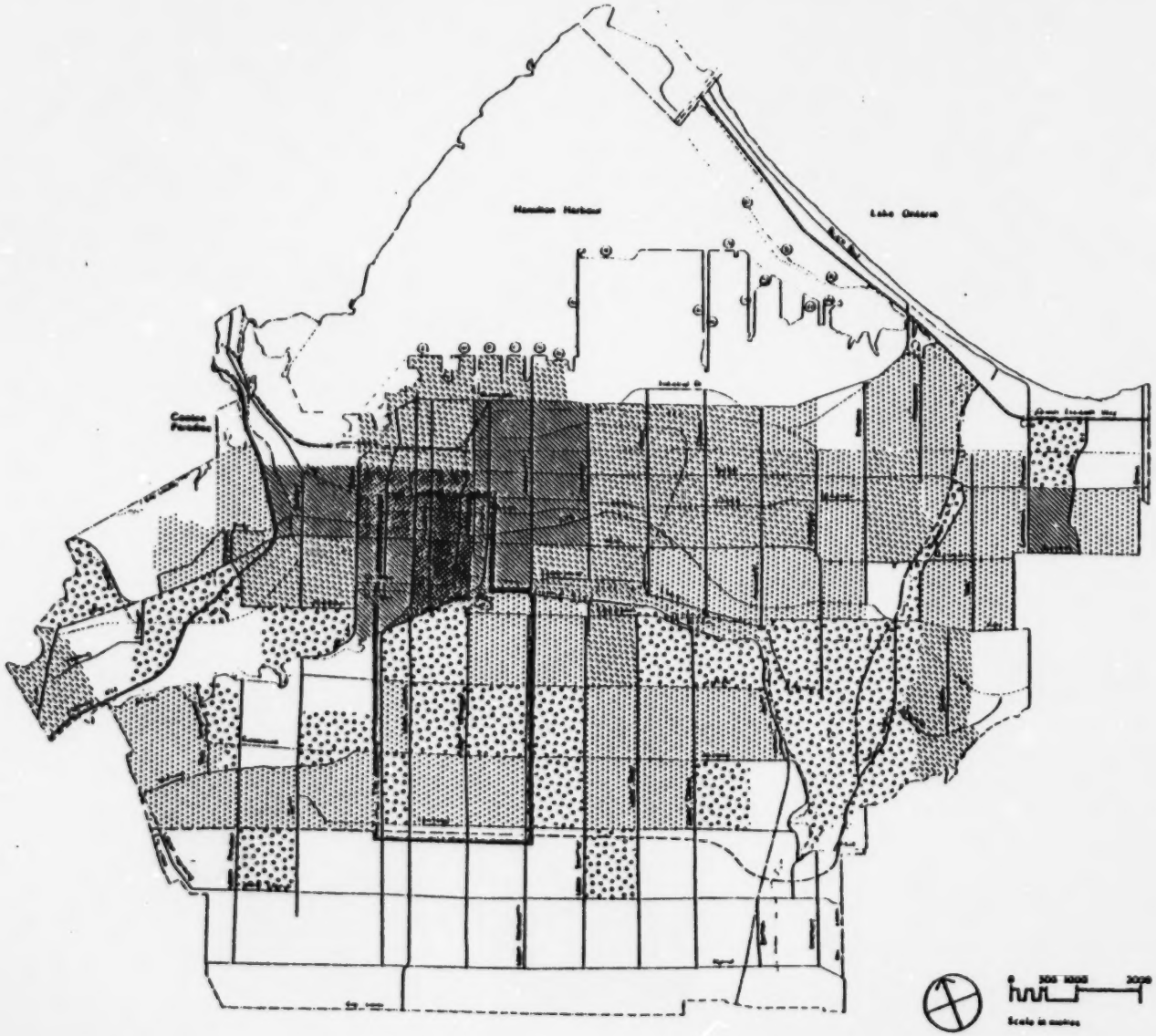
Hamilton–Wentworth Rapid Transit Project

POPULATION DISTRIBUTION

Fig. 3.4 Rapid Transit Rationale



Residential Densities and Concentrations

Source: City of Hamilton Draft Official Plan, 1980

Appendix C.2

Legend

Persons per net Acre *

- 80+
- 60 - 80
- 40 - 60
- 30 - 40
- 20 - 30
- < 20

* Density groups have been re-organized

Mountain Corridor

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Hamilton-Wentworth Rapid Transit Project

Figure 3.5 Rapid Transit Rationale

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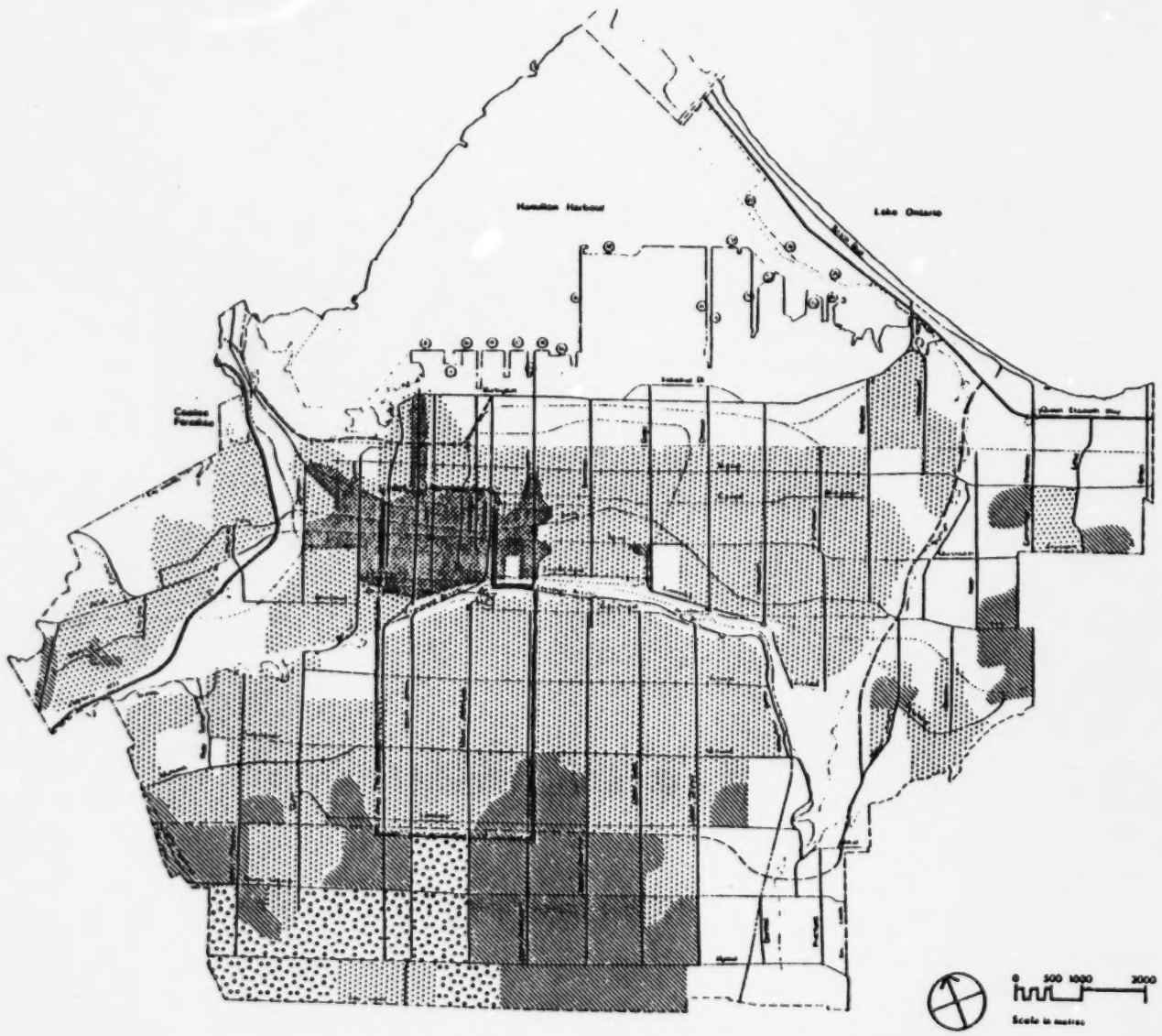

Residential Development Sectors *

Source: City of Hamilton Draft Official Plan, 1980
Appendix D.3

Legend

- Undeveloped
- Stable
- Transitional Developing
- Transitional Redeveloping

* Information shown to 1986

Mountain Corridor

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Hamilton-Wentworth Rapid Transit Project

Figure 3.6 Rapid Transit Rationale

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at an average density of 227 persons per net acre (ppna)[1] (560 persons per net hectare). Approximately 64% of these units would be apartments. At present there is little activity in this potential market despite low vacancy rates. This is principally due to a relatively low demand for apartments as a result of the high interest rates and generally low cost of housing in the region.

New development areas on the south escarpment will see a definite density increase. Current plans for areas north of Stone Church Road, and south of it east of Upper Wellington Street, indicate average densities of 46 ppna[2] (113.6 persons per hectare). This is significantly higher than existing north of Limeridge Road. Opportunities for higher densities exist in areas south of the Sub-regional Centre at Limeridge Road and Upper Wentworth Street. The City is currently preparing guidelines for improvements to the energy efficiency of these new developments.

Other areas on the escarpment in the mountain corridor are generally considered to be stable and fully developed despite the low densities. However, the Regional Official Plan forecasts include moderate population increases in this area. New development to support rapid transit would have to be carefully designed and integrated to be acceptable. Present limitations on residential densities might have to be reconsidered in some neighbourhoods.

3.3.4 Other Considerations Related to Residential Development

Improved transit ridership is only one of the benefits associated with a strong transit-oriented development option. Co-ordination of apartment locations with rapid-transit stations not only serves

1. City of Hamilton Draft Official Plan Table D.3.1.
2. City of Hamilton Draft Official Plan Table D.3.2.

a sector of the population which is more transit dependent but will give apartment dwellers in Hamilton a much more attractive choice of destination and work location particularly if the southern terminal is located at the Sub-regional Centre.

The 1976 Study[1] recognized the potential of rapid transit to encourage strong transit-oriented development. It also recognized that a possible ten year time gap would elapse before the effects of a major transit improvement would show significant effects on development patterns, but suggested that approximately 62% of the then projected 1986-2001 growth could be influenced.

3.4 Employment Growth Distribution and Characteristics

3.4.1 Recent Trends

The 1971 Census, the source of the most recent Regional employment data shown in Table 3.1 and Figure 3.7, indicates that 88% of the total 153 000 jobs in the Region were located in the City of Hamilton. Stoney Creek and Dundas were the next largest employment locations with 4% and 3% respectively.

As previously mentioned the City of Hamilton estimates that a large percentage of the 83% CMA growth between 1971 and 1979 has occurred in the City itself.

The former prominence of the City's manufacturing sector has declined slightly in recent years. From 1961-1971 employment in this sector, as a percentage of the total City employment, declined by 5.8%, while service employment increased by 5.1%.[2]

1. Recommended Priority Corridor Within the Basic Trunk Network Phase III Stage I of the Hamilton Rapid Transport Development Programme, 1976.
2. City of Hamilton Draft Official Plan, Appendix D-4.

> "The growth in the number of jobs, coupled with the recent shift in employment (growth) from the manufacturing sector to the service sector, suggests that the Hamilton CMA is becoming more economically diversified."[1]

3.4.2 Projected Growth to 2001

Of the total growth of 136 700 jobs projected by the Regional Official Plan between 1971 and 2001 (Figures 3.3 and 3.7), 69% are expected to locate in Hamilton.

Of the total Regional employment growth, approximately 20% is expected to be in manufacturing and construction with the remaining 80% in the service sector. Manufacturing and construction jobs are projected to increase by 37% from 71 000 to 97 000 and service jobs by 129% from 83 000 to 190 000.[2]

The predominance of service sector growth presents good opportunities to improve transit use provided a large proportion of these jobs are attracted to highly transit-oriented locations.

Rapid transit will help to encourage office employment to locate in the major City centres instead of in industrial-business parks where the Region has policies to discourage office development. It will also help to encourage existing businesses and industries to retain their urban location.

3.4.3 Industrial Areas

Industrial concentrations are mainly located in the north of Hamilton, from the harbour to Barton Street, and from Wellington Street in the west to Woodward Avenue in the east. This area contains the major steel production and fabrication plants, as well as a wide range of manufacturers and other industries.

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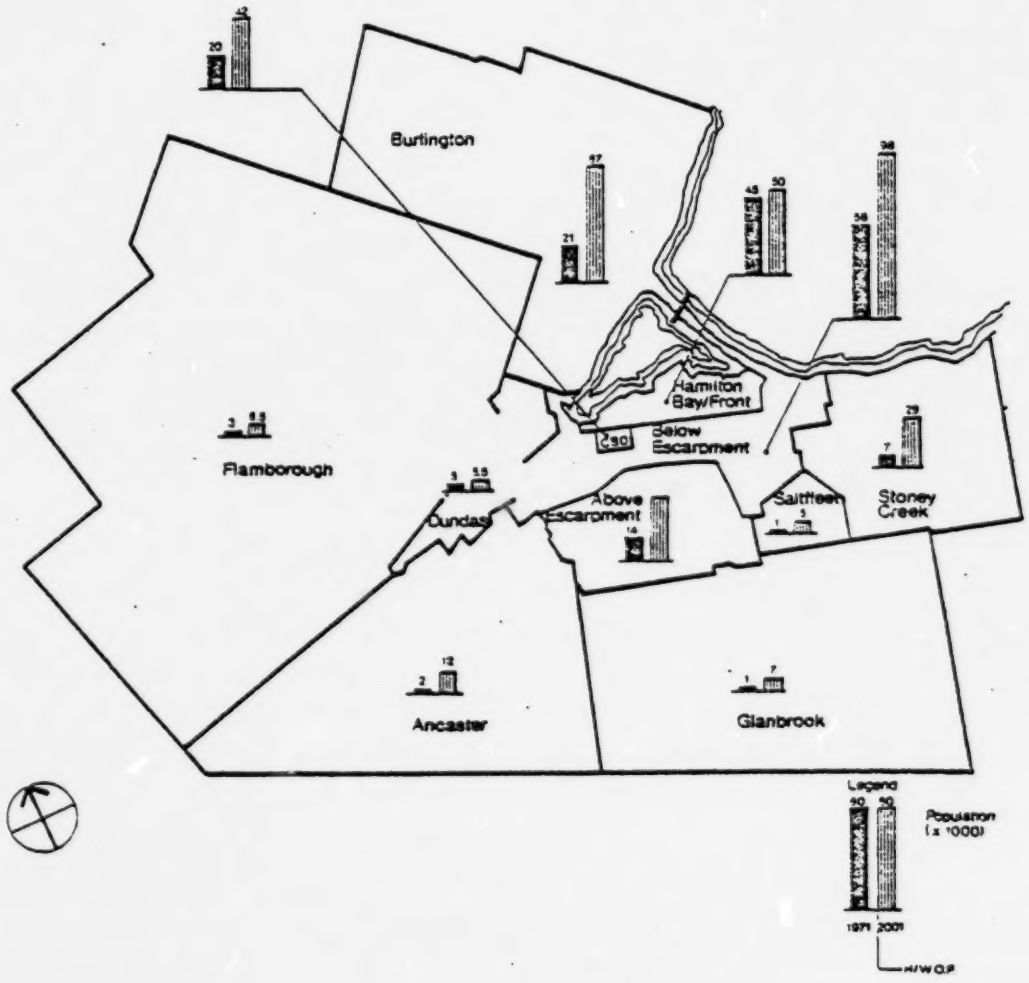
1. City of Hamilton Draft Official Plan, Appendix 4.
2. City of Hamilton Draft Official Plan, Appendix 4.



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Hamilton – Wentworth Rapid Transit Project

EMPLOYMENT DISTRIBUTION

Fig.3.7 Rapid Transit Rationale

Figure 3.8 shows the major existing industrial areas in Hamilton and Glanbrook. Although these areas are not considered to be high potential users of this rapid transit line, the line could influence the residential location of new industrial employees and attract a small percentage of trips related to these areas.

3.4.4 Commercial/Service Areas

Major commercial areas where the City's new service sector growth is expected to be concentrated are shown in Figure 3.9.

The Central Policy Area

The Regional Official Plan designates Downtown Hamilton as the Regional Centre and contains policies that promote its development as the most important multi-functional office employment area and retail centre in the Region.[1]

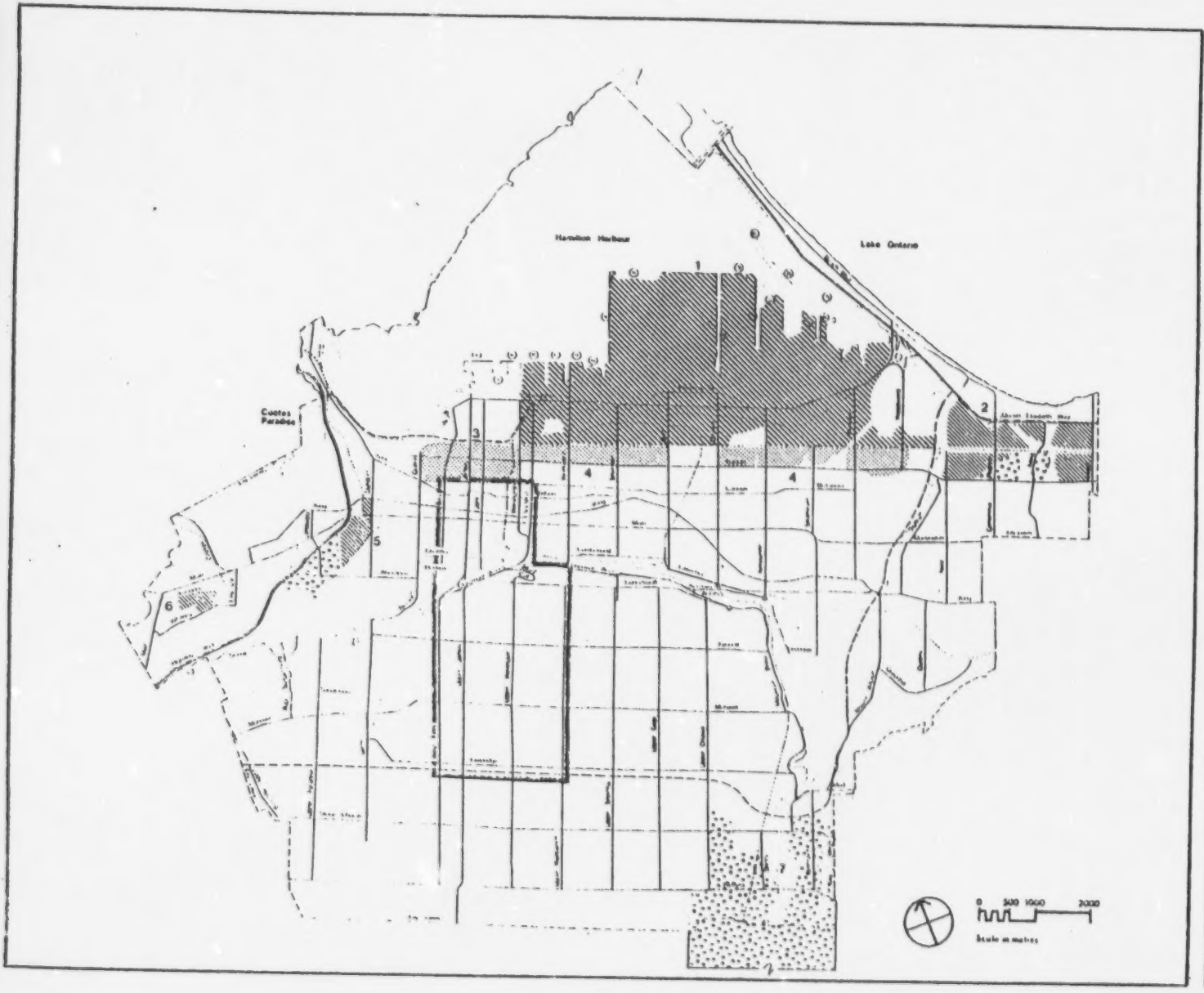
The area previously considered as the CBD is expanded to include commercial and institutional lands south of it in the Corktown and Durand neighbourhoods. Major service sector[2] growth is projected for the four neighbourhoods[3] in which this newly defined Central Policy Area is located.

A total of 37 000 new service jobs are expected to increase the present employment to 60 700 jobs by 2001.[4] This is 34.5% of the total projected growth in service employment.

Of the total 35 million square feet (3.25 million square metres) of commercial space permitted by existing zoning, at present only 7% or 2.3 million square feet (0.21 million square metres) has been constructed to date. This illustrates that there are ample opportunities for future development.

---

1. Regional Official Plan 2.2.1.
2. includes retail service and other employment.
3. the other two neighbourhoods are Central and Beasley
4. Calculated from Traffic Zone Data provided by the Regional Planning Department



Major Industrial Areas in Hamilton and Glanbrook

Legend		Employment 1971 – 2001*	
1	Bayfront	45,000	49,500
2	East Hamilton	4,700	9,300
3	Central Area	5,700	6,000 ▽
4	Barton Street	6,700	8,200 ▽
5	Chedoke	3,100	3,100 ▽
6	West Hamilton	600	600 ▽
7	East Mountain	500	11,400

▽ Manufacturing & Wholesale Only

* Hamilton-Wentworth Official Plan Projections Employment

Generalized Industrial Concentrations

- Heavy, Intense
- Light and General
- Scattered Manufacturing
- Vacant Industrial Land

Mountain Corridor

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Figure 3.8 Rapid Transit Rationale

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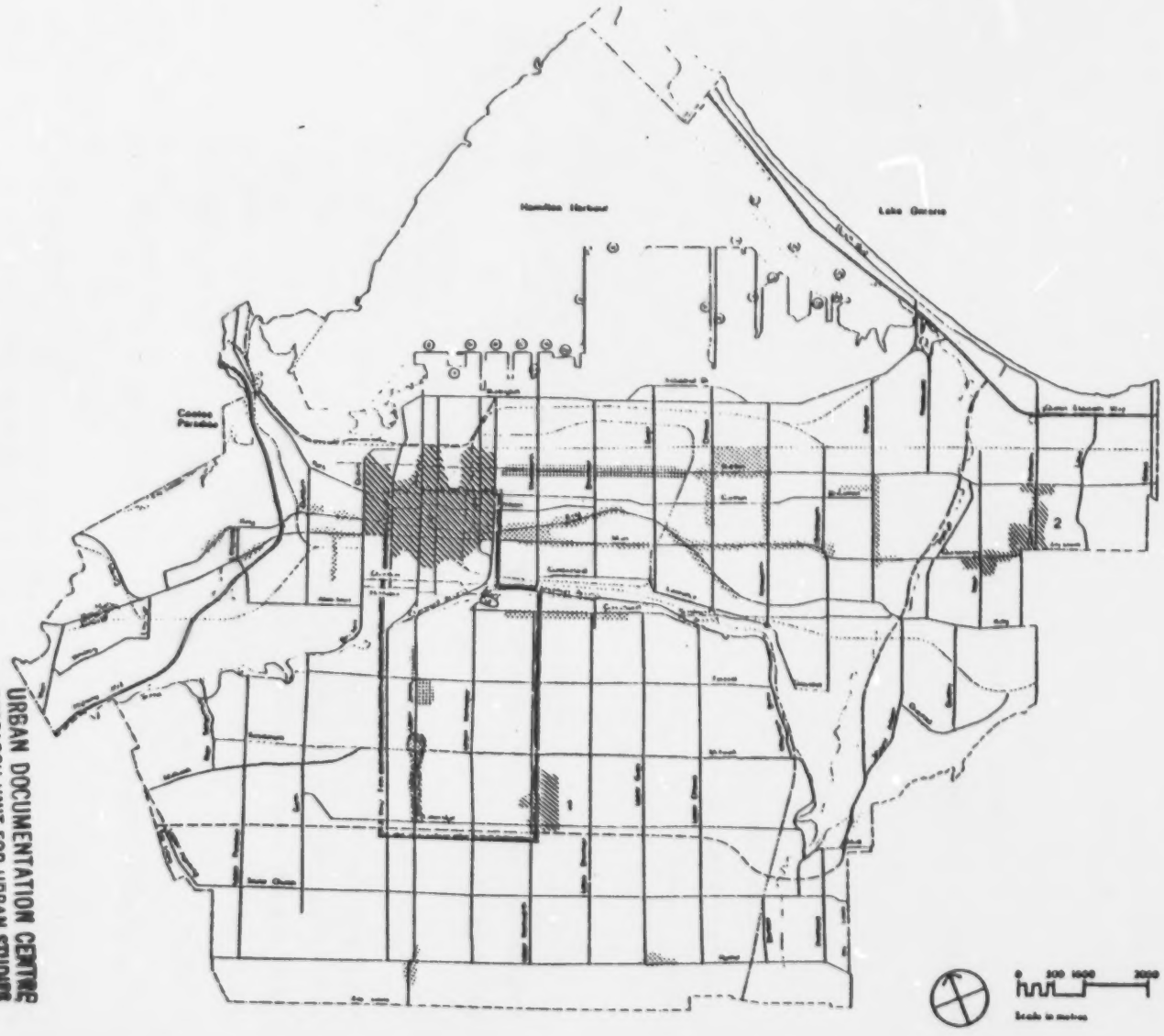

Major Commercial Areas in Hamilton

Legend

	Employment 1971	Employment 2001
Central Policy Area[1]	26,300	60,700
Sub-Regional Centres[2]		
1. Mountain	900	4,400
2. East	291	2,700
Extended Ribbon Commercial		
Extended Highway Commercial		

1 Employment figures for related travel zones excludes manufacturing & wholesaling previously shown.

2. Employment for the one related travel zone.

Mountain Corridor

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Hamilton-Wentworth Rapid Transit Project

Figure 3.9 Rapid Transit Rationale

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Hatch Associates Ltd.
Barton Myers Associates

November 1980

URBAN DOCUMENTATION CENTRE
RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

The recent Central Area Draft Plan has taken an ambitious position on development possibilities for the downtown. It adopts the position that

> "indirect inducements and incentives to private investors and consumers are often far more powerful than providing direct government services. The Plan attempts to substantially improve the image of the Central Area as the key incentive to attract new development." (It aims at an) "attractive, lively, human-scale environment with the physical, social and human infrastructure in place..."[1]

Rapid transit in the form of ICTS in downtown Hamilton could certainly support these objectives and improve accessibility to the central area although a concerted effort will have to be made in the areas of urban integration and design.

The Mountain Sub-Regional Centre

The Regional Official Plan designates a sub-regional centre: on the Hamilton Mountain at Upper Wentworth Street and Limeridge Road. The multi-functional centre is planned to contain major concentrations of retail and office space.[2]

The first stage of the Mountain Sub-Regional Centre, which is presently under construction, will approximately 1 000 000 square feet (91.500 square metres)[3] of commercial space and will generate an estimated 2 000 - 2 500 jobs.[4]

Phase 2 of this project could increase this by 50%. By the year 2001 approximately 10 000[5] jobs are expected to be located in the eight neighbourhoods surrounding this centre between Mohawk Road and Stone Church Road. These jobs will primarily serve the local escarpment residents.

1. The Central Area Draft Plan, Preamble, Advisory Committee, October 1979.
2. Regional Official Plan Sextion 2.2.2
3. Regional Planning Department
4. Based on 36 to 45 square metres per employee
5. Data from Regional Planning Department given by Traffic Zones

3.5 Summary

The City and Region are optimistic that efforts to attract new development and reverse existing growth trends will succeed. To date, the public sector has made a considerable financial and social commitment to the Region's growth objectives. The construction of rapid transit would further support past and present commitments and development objectives.

Rapid transit in the Mountain corridor could help to stimulate population growth rates. Provided that the rental apartment construction market improves, the opportunity to achieve a transit-oriented development structure exists. The high proportion of new jobs expected in the service sector presents an ideal opportunity for transit oriented development in the CBD and, to a lesser degree, at the Sub-Regional Centre. Rapid transit can also be highly compatible with present efforts to improve the attractiveness and image of the Centra Area and to stimulate new private development.

4. TRAVEL DEMAND

4.1 Introduction

The approach adopted for use in this phase of the study was a simplified procedure geared towards the establishment of a sound and reliable data base using, wherever possible, current information contained within available transportation or planning documents. Wherever data was either not available or considered not to be sufficiently accurate for this assignment, supplemental information was gathered from the Regional Municipality of Hamilton-Wentworth and the data base was updated accordingly.

The studies reviewed within this investigation are included in Appendix A of this report. Four documents which were particularly useful are identified as follows:

- Draft Transportation Capital Facilities Plan - Phase 1, A substudy of the Regional Official Plan, Report No. 6, Regional Municipality of Hamilton-Wentworth, December 1979

- Draft Transportation Capital Facilities Plan - Phase 2, A substudy of the Regional Official Plan, Report No. 6, Regional Municipality of Hamilton-Wentworth, June 1980

- Recommended Priority Corridor Within The Basic Trunk Network, Hamilton Rapid Transit Development Programme - Phase III, Stage 1, September 1976

- Development of a Travel Forecasting Model, A substudy of the Regional Official Plan, Report No. 3, Regional Municipality of Hamilton-Wentworth, October 1976.

The methodology consisted of the following three activities:

1. Review Major Travel Corridors
2. Document Corridor Travel demands
3. Identify Corridors with Rapid Transit Potential

4.2 Review of Major Travel Corridors

Six travel corridors, each focused on the central area of Hamilton, were identified in previous studies[1] as having potential for the development of relatively high transit volumes. The corridors and respective screenlines are illustrated in Figure 4.1. The corridors are:

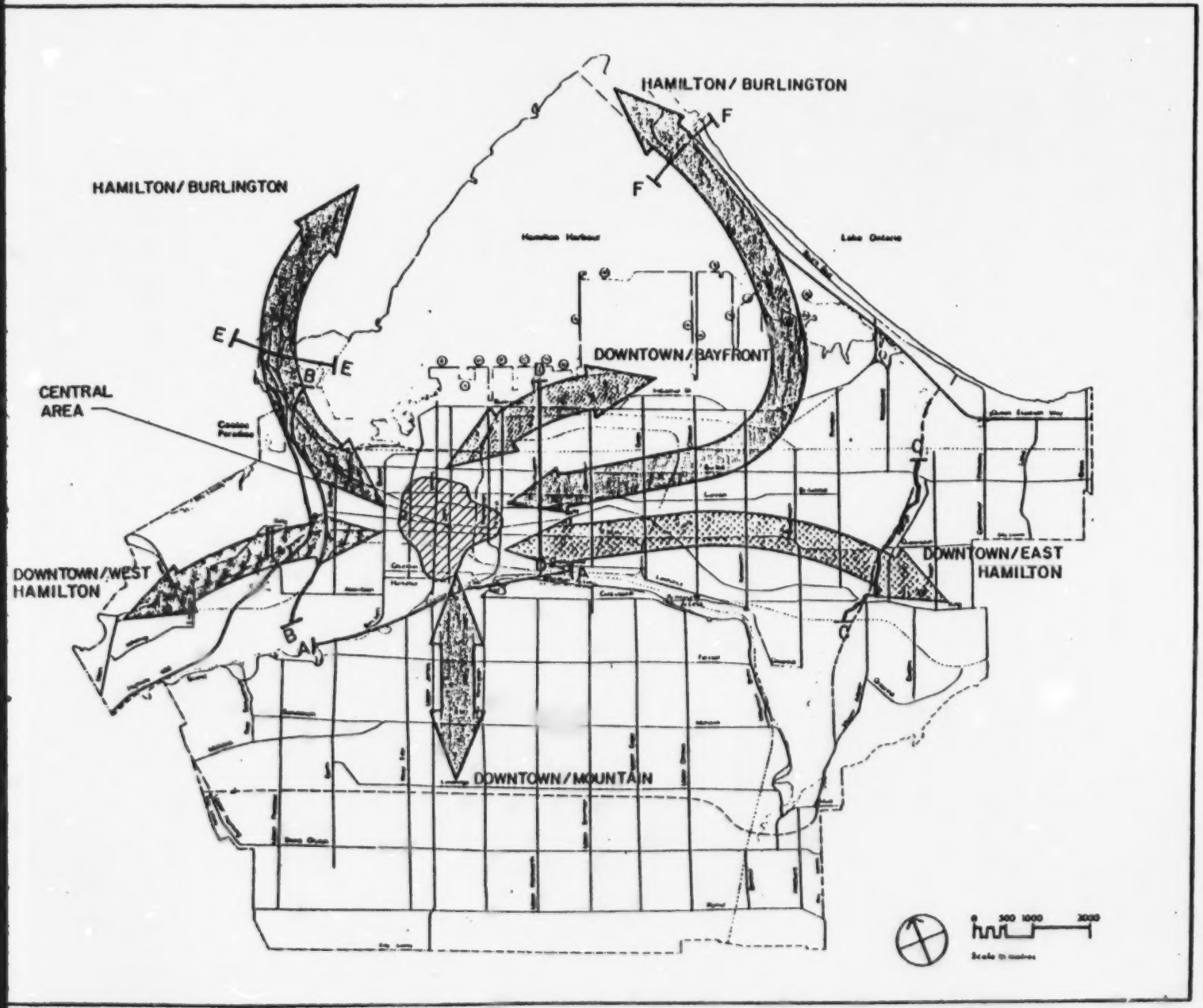
a) Mountain
b) West Hamilton
c) East Hamilton
d) Bay Front Industrial Area
e) Burlington via Highway No. 403, and
f) Burlington via Beach Boulevard

A brief description of the screenlines and of the major roads within the corridors crossing the screenlines is presented in Table 4.1.

4.3 Corridor Travel Demands - Existing and 2001

Corridor travel demands were derived from data contained in the Region's Draft Transportation Capital Facilities Plan. This information was prepared by Regional staff using a computerized travel forecasting model. The forecasting model utilized existing or projected land use data in conjunction with pre-determined travel characteristics observed within the Region to generate corridor travel demands during the roadway PM peak hour.

1. Recommended Priority Corridor Within the Basic Trunk Network Hamilton Rapid Transit Development Programme - Phase III, Stage I, September, 1976.



Major Travel Corridors & Screenlines

Legend

MAJOR TRAVEL CORRIDOR

SCREENLINES

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Hamilton-Wentworth Rapid Transit Project

Figure 4.1 Rapid Transit Rationale

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Hatch Associates Ltd.
Barton Myers Associates

November 1980

The planning period adopted for this analysis of corridor travel demand utilized 1978/79 as the base year, and 2001 as the horizon year.

Table 4.1

Screenline Descriptions

Screen Line	Location	Major Roads Crossing The Screenline
A*	Hamilton Escarpment- From: Highway No. 403 To: Sherman Access	Beckett Drive Claremont Access Jolley Cut & James Mountain Road Sherman Access
B	East of Highway No. 403- From: Harbour To: Escarpment	York Boulevard King Street Main Street Aberdeen Avenue
C	Red Hill Creek- From: Escarpment To: CN Rail Line	King Street Queenston Road Barton Street
D	Wentworth Street- From: Harbour To: Escarpment	Charlton Avenue Main Street King Street Cannon Street Barton Street Burlington Street Stinson Street Wilson Street
E	East of Highway No. 6- From: Harbour To: Escarpment	Highway No. 403 Highway No. 2
F	Beach Strip Canal- Burlington/Hamilton Limits	Queen Elizabeth Way Beach Boulevard

* comprises Screenline 15 from the Draft TCFP plus the westerly access to the Sherman Cut

Land use scenarios which were adopted for use in this chapter were described previously in Chapter 3. These scenarios differ slightly from those assumed by Regional Staff in the preparation of the year 2001 travel forecasts. With the exception of one item the differences are not considered significant. The one exception is the year 2001 population assigned to the City of Burlington. Regional Staff adopted a figure of 244 000 persons. This figure has since been revised to 170 000 persons to reflect the Official Plan of that Region by the Region of Halton. This significant variation was taken into consideration by the study team in the assessment of future travel needs (Section 5.2.1). However the travel demands published in the Draft Transportation Capital Facilities Plan were not revised to reflect the difference.

Presented in Table 4.2, are the total person trip demands at each of the corrdor screenlines existing in 1978 and projected for the year 2001. The volumes represent total person trips by auto and transit, in the peak direction of travel during the roadway PM peak hour.

Also presented in Table 4.2 are the existing road capacities and the projected future corridor deficiencies in the peak direction of travel during the roadway P.M. peak hour. Road capacities were taken from the Draft Transportation Capital Facilities Plan, supplemented by information provided by Regional Staff and converted to person trips using an auto occupancy factor of 1.38 persons per vehicle in accordance with the procedure used by the Region. Corridor deficiencies are defined as the difference between the projected total person trip demands for the year 2001 and the present auto trip capacities of the existing roads (excluding transit).

If no major road improvements were to be undertaken, corridor deficiencies in the year 2001 would be as shown in Table 4.2. The East .Hamilton and Bay Front Corridors would exhibit minor deficiencies ranging from 1 690 to 2 820 person trips. The Burlington corridors would exhibit greater deficiencies ranging

Table 4.2

Corridor Travel Demands*

Corridor	Screen Line	Direction of Travel	Person Trip Travel Volumes 1978	Person Trip Travel Volumes 2001	1980 Existing Road Capacity Auto Person Trips(3)	Projected Corridor Deficiency (Person Trip
Mountain	A	SB	10 550	19 670	13 020	6 650
West Hamilton	B	WB	9 280	21 480(1)	10 500	10 980
East Hamilton	C	EB	5 600	8 130	6 440	1 690
Bay Front	D	WB	9 660	15 290(2)	12 470	2 820
Burlington (via Highway No. 403)	E	EB	5 300	16 300	10 170	6 130
Burlington (via Beach Boulevard)	F	NB	5 020	13 510	5 770	7 740

1. Travel demands across Screenline B include travel demands in both the west Hamilton and Burlington (via Highway No. 403) corridor.

2. Travel demands across Screenline D include travel demands in the Bay Front Industrial Area, East Hamilton and Burlington (via Beach Boulevard) corridors.

3. Capacity in terms of person trips by automobile, based on 1.38 persons per auto.

* Based on data from the Draft Transportation Capital Facilities Plan

from 6 130 to 7 740 person trips. The Mountain corridor would exhibit a deficiency of 6 650 person trips and the West Hamilton corridor would experience the greatest deficiency of approximately 10 980 person trips in the peak direction of travel during the roadway PM peak hour.

In general all of these deficiencies are not likely to be encountered. Standard Municipal planning and engineering programs supplemented by annual reviews and updates designed to identify transportation improvement requirements will ensure the implementation of corrective measures to increase corridor capacities in a timely manner. The corrective measures may include the construction of new roads or improvements to existing roads. However, in the Mountain Corridor there is a severe limitation on the potential road improvements as a result of Regional Official Plan policies which do not permit construction of additional roads across the escarpment and allow only minor improvements to the approaches to existing mountain access routes. Alternatively, in accordance with Regional Official Plan policies supporting increased transit usage, the corrective measures may include improvements to the existing transit systems to accommodate the expected demands.

4.4 Corridors With Rapid Transit Potential

The capacity of on-street transit systems which operate in mixed traffic is governed by roadway operating speeds, the number and size of vehicles in operation, passenger loading/unloading times and stop spacing. In general, on-street transit systems consisting of buses and/or streetcars operating in mixed traffic can accommodate approximately 6 000 passengers per hour per direction[1] at average running speeds of 15-25 km/h.

1 Sources: a) Urban Transit Operations, An Introduction, Ministry of Transportation and Communications, Ontario, Transit Systems Research and Development Office, June 1979.

b) Canadian Transit Handbook, Soberman R.M., Hazard H.A., January 1980.

The intent of rapid transit is to attract a higher proportion of travellers by offering improved levels of transit service and higher capacities than those systems operating in mixed traffic. Rapid transit systems located within exclusive rights-of-way can operate at speeds in the order of 40 to 50 km/h. Intermediate capacity rapid transit systems can accommodate passenger demands of up to 20 000 persons per hour per direction. High capacity rapid transit can accommodate passenger demands up to 40 000 persons per hour per direction.

On the basis of the above, corridors with deficiencies less than 6 000 person trips per hour are not considered to have potential for rapid transit. Deficiencies within these corridors can be accommodated by improvements to the existing surface bus transit system. Conversely, corridors with deficiencies in excess of 6 000 person trips per hour are considered to be candidates for rapid transit. A preliminary screening of Table 4.2, suggests that four corridors exhibit such potential. These corridors are identified as the Mountain Corridor, the West Hamilton Corridor and the two Hamilton/Burlington Corridors.

Presented in Table 4.3 is a listing of the potential road improvements by corridor taken from the Region's Transportation Capital Facilities Plan. The status of these projects has been reviewed and confirmed with the respective road authorities. Of the improvements listed within the Burlington (via Beach Boulevard) Corridor, two have been allocated funds within the current five year capital budget. Construction of a new four lane arterial road is scheduled to commence in 1981. Twinning of the Skyway bridge is to commence in 1982-83. Both projects are scheduled for completion by 1986.

With these new facilities in place, the total capacity of the two Hamilton/Burlington Corridors will be increased by approximately

TABLE 4.3

POTENTIAL ROAD IMPROVEMENTS BY CORRIDOR*

Corridor	Road	Section	Improvements	Additional Hourly Capacity In Veh Trips (Person Trips)	Commencement Early Start	Commencement Late Start
Mountain	Sherman Access (2)	Up the Sherman Cut Concession to Crockett	Reconstruction and Intersection Improvements	375(3) (1040)	1984-85	
Mountain	Jolley Cut & James Mountain Rd.	St. Joseph's/ Arkledun-James St. to Kingsway	Widening and Channelization	1100 (1520)	1994-97	
West Hamilton	Aberdeen Ave.	At Dundurn	Intersection Improvements	800 (1100)	1984-85	
West Hamilton	Perimeter Industrial Rd.	Sherman Ave. to Highway No. 403	New Facility - 4- lanes	3350 (4620)	1984-85	1986-89
Burlington (via Highway No. 403)	Plains Rd.	At Highway No.6	Grade Separate	1050	1990-93	
Burlington (via Highway No. 403)	Highway #403	King St. to Highway No. 6	Widen to 8 Lanes	(1450) 2300 (3170)	1990	1994
Burlington (via Beach Boulevard)	Beach Arterial(2)	Burlington St. to Beach Canal	New Arterial 4 Lanes.	3000 (4140)	1981	
Burlington (via Beach Boulevard)	Q.E.W. Skyway (1)	Canal	Twin Bridge Structure 5 Lanes	3660 (5050)	1982-83	

1) Source - Region of Hamilton - Wentworth, Draft Transportation Capital Facilities Plan - Phase 2, June 1980, updated to reflect current conditions.

2) Committed improvements allocated funds within the current five year capital budget.

3) Potential of 750 additional vehicle trips. Assume 50 percent to be applied to the Mountain Corridor screenline (375).

* Based on data from the Transportation Capital Facilities Plan

9 200 person trips per hour per direction. Whereas these improvements by themselves may not totally alleviate the projected year 2001 deficiencies in the Hamilton/Burlington corridors, they will defer the need for other major transportation improvements over the short term and they do eliminate the potential requirement for rapid transit.

Taking into consideration the higher population and respective travel volumes assigned to the City of Burlington by Regional Staff (refer to Section 4.3 of this report) and the committed road improvements it is concluded that only the following two corridors exhibit a potential for rapid transit;

- Mountain Corridor
- West Hamilton Corridor

Contained within the following chapter is a refined assessment of the projected growth in vehicular travel within these two corridors, which details modal splits and alternative transportation improvements.

5. CONFIRMATION OF MOUNTAIN CORRIDOR PRIORITY

5.1 Introduction

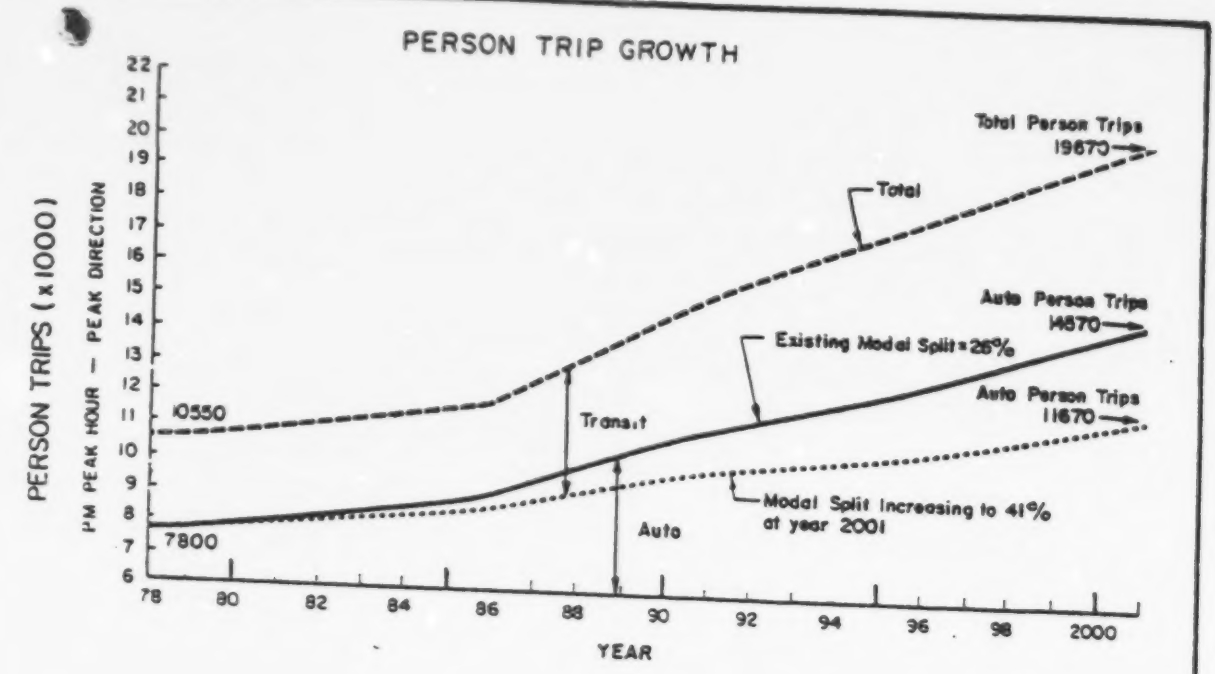
In this chapter, a more detailed review is made of the land use and transportation factors that were considered in the selection of the first priority corridor. The conclusions arrived at in recent studies are presented followed by a reassessment of the data that led to these conclusions.

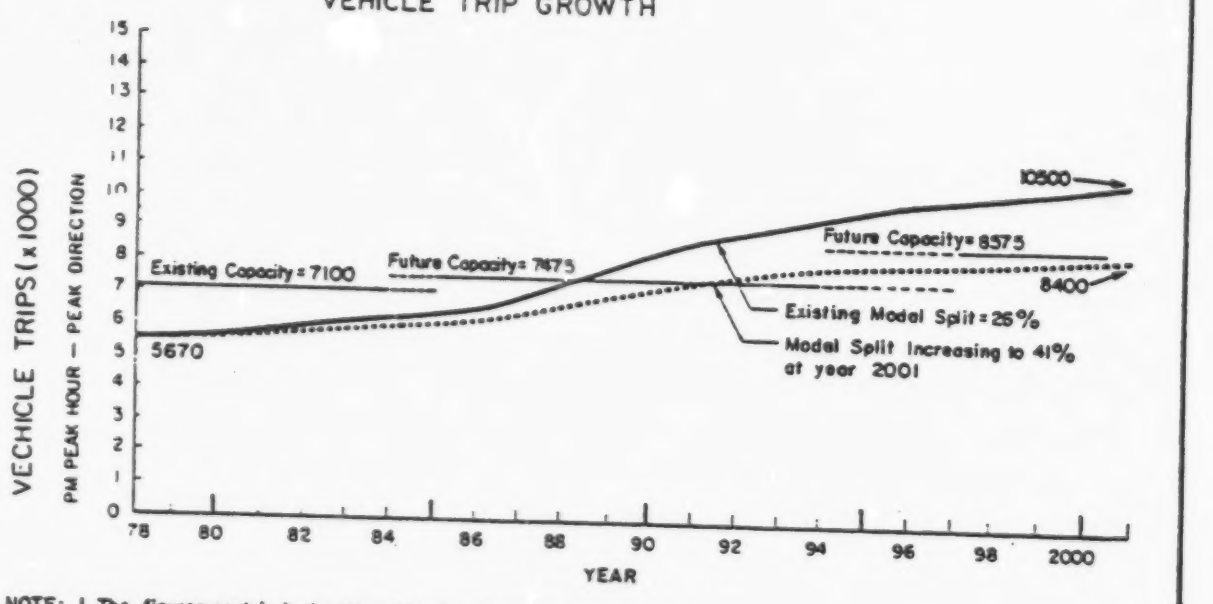
5.2 Transportation Service

5.2.1 Screenline Analysis

Figure 5.1 shows a detailed projection of the growth in travel demand within the Mountain Corridor to the year 2001. Specifically detailed are the projected growth in person trip travel by auto and by transit, the projected growth in vehicular travel by auto, the projected growth in travel by transit and the increase in the corridor road capacity likely to occur, as a result of the potential road improvements identified in Table 4.3.

The 1978 characteristics and the year 2001 projections were taken from the Region's Draft Transportation Capital Facilities Plan. The 1978-2001 forecasts were developed by the study team using the Region's current estimates of population growth and distribution. The underlying assumption is that the rate of growth in travel within the corridor is expected to increase in proportion to the rate of population growth. On this basis, it is estimated that vehicular travel within the Mountain Corridor will increase as indicated in Table 5.1.





NOTE: 1. The figures pertain to the Mountain Corridor described in Table 4-1
2. Travel demands and road capacities are derived from the Region's Draft Transportation Capital Facilities Plan, June 1980

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TRAVEL DEMAND – MOUNTAIN CORRIDOR

Fig. 5.1 Rapid Transit Rationale

Table 5.1

Projected Growth in Vehicle Travel Demand

In the Mountain Corridor

Year	P.M. Peak Hour Vehicle Trips[1]	
	(26% Transit)[2]	(41% Transit)[3]
Existing	5 700	N/A
1986	6 200	5 950
1991	8 000	7 000
1996	9 200	7 700
2001	10 500	8 400

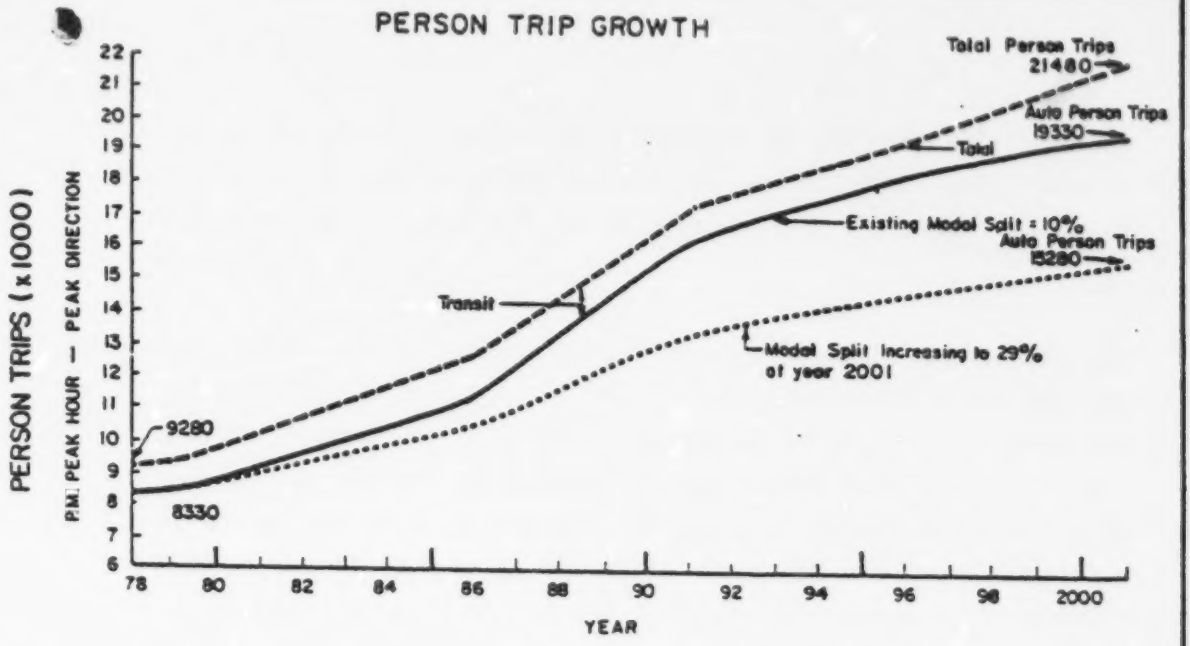
(1) Peak Direction

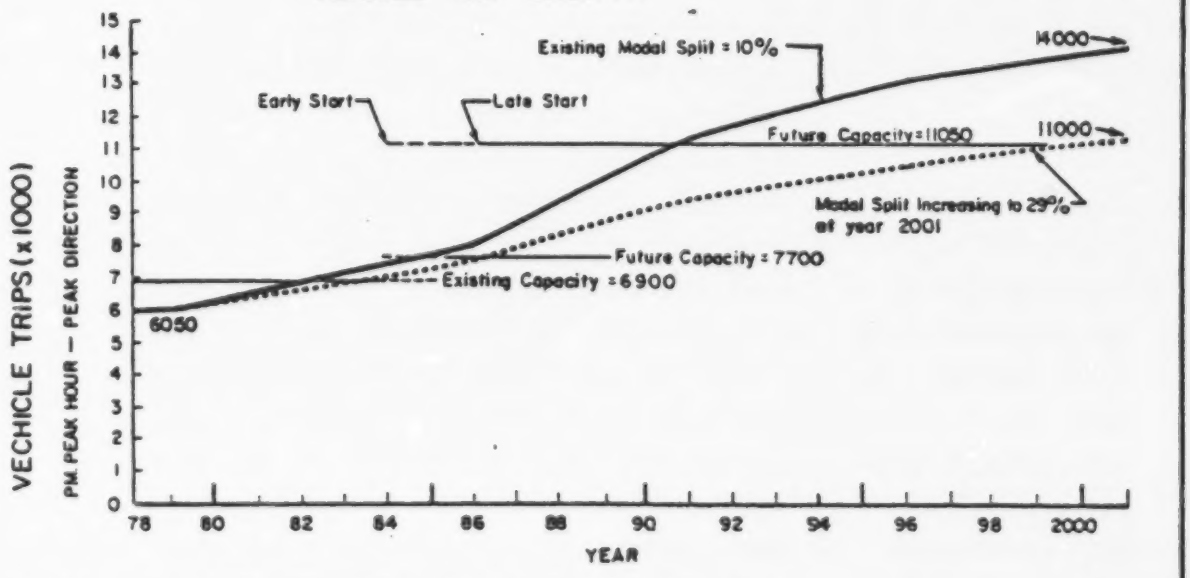
(2) Existing modal split.

(3) Potential future modal split.

Current data indicate a modal split of 26 percent within the Mountain Corridor during the roadway P.M. peak hour. This figure represents an existing travel demand by transit, in the peak direction, of approximately 2 750 person trips and a future volume of approximately 5 100 person trips in the year 2001. Regional projections, taking into consideration transit system improvements including the implementation of an exclusive transit right-of-way within the corridor suggest that the modal split could increase to 41 percent by the year 2001 and that the corridor transit volume during the roadway P.M. peak hour could increase to 8 000 person trips in the peak direction.

Corresponding curves for the West Hamilton Corridor are presented in Figure 5.2. Within this corridor vehicular travel in the peak direction during the P.M. peak hour is projected to increase from 6 050 vehicle trips in 1978 to between 11 000 and 14 000 vehicle trips by the year 2001. Travel by transit currently estimated at





NOTE: 1. The figures pertain to the West Hamilton Corridor described in Table 4-1.
2. Travel demands and road capacities are derived from the Region's Draft Transportation Capital Facilities Plan, June 1980

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TRAVEL DEMAND — DOWNTOWN / WEST HAMILTON CORRIDOR

Fig. 5.2 Rapid Transit Rationale

950 person trips is projected to increase by the year 2001 to 2 150 person trips assuming the current 10 percent modal split and to 6 200 person trips assuming an increase in the modal split to 29 percent.

Information concerning the distribution of these travel demands was derived using 1978 traffic counts conducted by the City of Hamilton Traffic Department. From counts conducted within the West Hamilton Corridor it can be concluded that during the P.M. peak hour over 4 000 vehicle trips in the peak direction of travel are destined to Highway No. 403 and to points beyond the study corridor. Expressed in another manner, the figures indicate that of all the vehicle trips made during the P.M. peak hour, over 65 percent are destined to points beyond the study corridor, with many of them being destined to Burlington.

In the Mountain Corridor, it was found that the majority of the P.M. peak hour vehicle trips originate in the downtown or Bay Front industrial area and terminate on the Mountain.

Additional information concerning the growth in travel within these two corridors is provided in the Transportation Capital Facilities Plan. From the information contained therein it is expected that vehicle trips destined to Burlington will continue to represent the major proportion of travel in the West Hamilton Corridor until 2001. Taking this information into consideration it has been suggested by the Region that a fixed route rapid transit line located in the West Hamilton Corridor would be of limited usefulness in serving these travel demands. Furthermore the reduction in projected population for Burlington from 244 000 to 170 000 will result in a lower travel demand in the West Hamilton Corridor. Therefore, that of the two corridors under review, the Mountain Corridor exhibits the higher potential for rapid transit.

5.2.2 Transportation Improvement Alternatives

The potential road improvements under consideration within the West Hamilton Corridor are outlined in Table 4.3. They include intersection improvements to Aberdeen Avenue, and the construction of a four lane arterial road, commonly referred to as the Perimeter Industrial Road. To date neither project has been allocated the necessary funds for implementation. However, the nature of these improvements is such that they are likely to be implemented.

The proposed improvements to Aberdeen Avenue are relatively minor and operational in nature, and therefore have a high likelihood of implementation. The Perimeter Industrial Road is a major undertaking which would provide a westerly continuation of the Burlington Street Corridor connecting to Highway 403. Completion of this link (together with currently scheduled major improvements at the east end of the Burlington Street Corridor connecting to the Q.E.W.) would provide a major arterial truck access route from the provincial freeway system into the Bay Front Industrial area. The Perimeter Industrial Road could divert a significant proportion of the heavy truck traffic from arterial streets through the lower City area.

Because of the importance of the Perimeter Industrial Road relative to truck traffic as well as providing additional road capacity, there is a good probability of construction proceeding. Therefore significant additional road capacity is feasible and achievable in the West Hamilton corridor, which will delay the need for implementation of transit improvements.

As illustrated in Figure 5.2, the existing road capacity within the West Hamilton Corridor is approximately 6 900 vehicles per hour in the peak direction of travel during the P.M. peak hour. With the improvements proposed along Aberdeen Avenue, the capacity would be increased to 7 700 vehicles per hour. The construction of the

Perimeter Industrial Road would result in a further increase in capacity to 11 050 vehicles per hour.

From the information available, the West Hamilton corridor is currently operating at or near capacity. If implemented these road improvements would satisfy the demands for the next 10 years. To fully satisfy the projected Year 2001 demands additional improvements to the road and transit service will eventually be necessary.

In view of the fact that over 65 percent of the travel within the corridor is destined to Highway No. 403 and beyond, it would appear that improvements to the inter-regional transit services should be a major component of future systems.

Mountain Corridor

The potential road improvements under consideration in the Mountain Corridor include reconstruction and intersection improvements to the Sherman Access and widening and channelization on the approaches to the Jolley Cut and James Mountain Road access routes. In the Region's current five year capital budget, funds have been allocated for the improvements along the Sherman Access but not for the improvements proposed to the Jolley Cut/James Mountain Road access routes.

As illustrated in Figure 5.1, the existing road capacity in the Mountain Corridor is approximately 7 100 vehicles per hour. With the improvements proposed along the Sherman Access the capacity would be increased to 7 500 vehicles per hour. The improvements along the Jolley Cut and James Mountain Road would increase the capacity to 8 600 vehicles per hour.

In the Mountain Corridor, it is recognized that it is not possible to provide road improvements, which can satisfy the travel demands

associated with the Official Plan development forecasts. The sensitive nature of the escarpment, plus the difficulty and expense of construction, and the stated policy that no new road facilities will be built in this corridor the need for improved transit services. The travel patterns and concentration of demand in the corridor suggest that rapid transit is a viable option. Rapid transit on an exclusive right-of-way would in attract the level of ridership necessary to make the corridor operate at a satisfactory level of service over the long term.

5.2.3 Transit Usage

As was reported in Chapter 4 the potential transit ridership is greater in the Mountain Corridor even though the projected total person travel demands are heavier in the West Hamilton Corridor. Existing and projected transit ridership by corridor is as follows:

Transit Ridership
(peak hour person trips - peak direction)

Corridor	Observed 1978	Forecast 2001
Mountain	3 000	5 000 - 8 000*
West Hamilton	950	2 000 - 6 000

* Range dependent on assumed level of service and associated modal split to transit.

Although these are projected road deficiencies in the West Hamilton corridor, the feasibility of significant road capacity improvements, together with the high proportion of corridor demand destined to Burlington result in a low priority for major transit improvements in the West Hamilton Corridor relative to improvements in the Mountain Corridor.

However, in the Mountain Corridor the inability to provide major road improvements and the concentration of travel demand suggest that rapid transit is a practical option.

5.3 Special Development Features In Support of Rapid Transit Within the Mountain Corridor

5.3.1 Introduction

The results of the screenline analysis in Section 5.2.1 reflect the general development characteristics discussed in Chapter 3. The basic differences between the two corridors can be summarized as follows:

The Mountain Corridor is centrally located in the existing urban area of the Region. Its catchment area contains the major residential and commercial growth areas, as well as several industrial growth areas of the Region.

The West Hamilton Corridor is much less central and its catchment area is divided between a relatively small immediate area and distant Highway 403 locations such as Burlington. Its immediate catchment area is primarily a low/medium density residential, university and open space area. Future growth is expected to be limited residential infill, redevelopment and expansion. Compared to the Mountain Corridor, there are considerably fewer opportunities to shape new growth or to structure it around a rapid transit line.

In addition to these general characteristics, other specific types of land use are identified below as items for special consideration in rapid transit planning and service.

5.3.2 Major Transportation Terminals

Presented in Figure 5.3 are the following major transportation terminals:

UNION STATION: handles CN rail service, VIA and GO rail service.

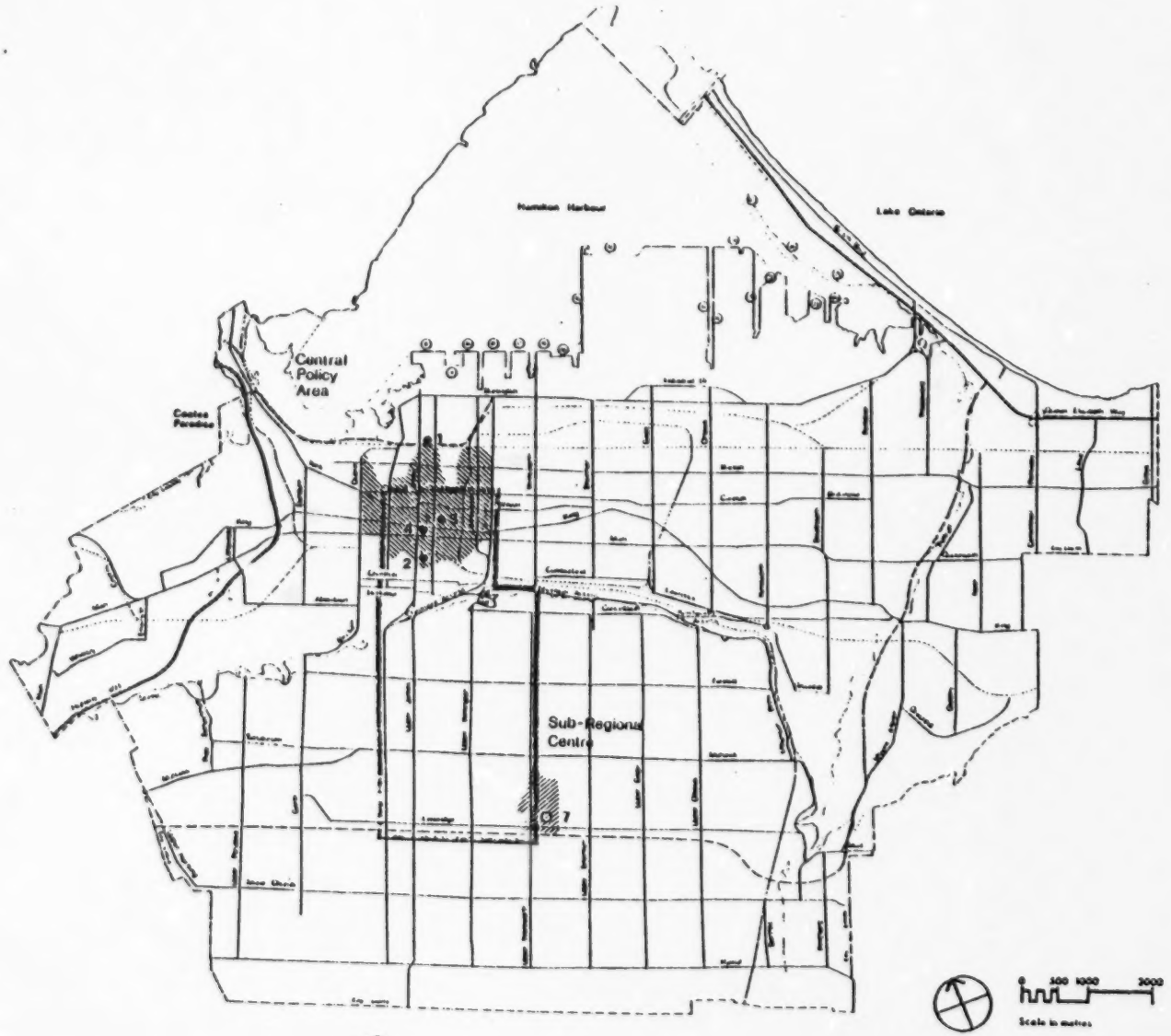
TH&B STATION: handles CPR and Toronto, Hamilton and Buffalo railway service and has been considered as a possible alternative for GO rail service.

HAMILTON BUS TERMINAL: presently accommodates Canada Coach GO transit and other lines.

NEW INTER-CITY BUS TERMINAL: the Province, the Region and the City are in the process of investigating the feasibility of locating and building an inter-city bus terminal in the Central Policy Area of Hamilton. The location criteria for the facility include proximity to other forms of public transit, pedestrian routes, existing and proposed employment and retail centres, adequate parking facilities, and ease of access for transit vehicles. The decision on the location of the new facility will be influenced by the recommendation of the Hamilton-Wentworth Rapid Transit Study.

GORE PARK: is the present central turn around point for many city bus routes including all Mountain bus routes. It is also the major pedestrian space in downtown Hamilton.

MOUNTAIN SUB-REGIONAL CENTRE: is planned to be a focal point for transit service above the escarpment in Hamilton. It could also be a major modal interchange for traffic entering the City from highways connecting to, and traffic on, the planned east/west mountain arterial road.



6 (A)

Major Transportation Terminals in Hamilton

Legend

1. Union Station
2. TH&B Station
3. Hamilton Bus Terminal
4. Gore Park
5. Multi-mode Transportation Termina
6. Mount Hope Airport
7. Mountain Sub-Regional Centre

- ● Existing
- O Future
- • Location still to be decided

Mountain Corridor

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Figure 5.3 Rapid Transit Rationale

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5.3.3 Major Institutions

Figure 5.4 shows the existing and planned location of major medical, social service and post-secondary institutions in the City. Many of these are located within the Mountain Corridor. Most of these facilities could benefit from rapid transit service.

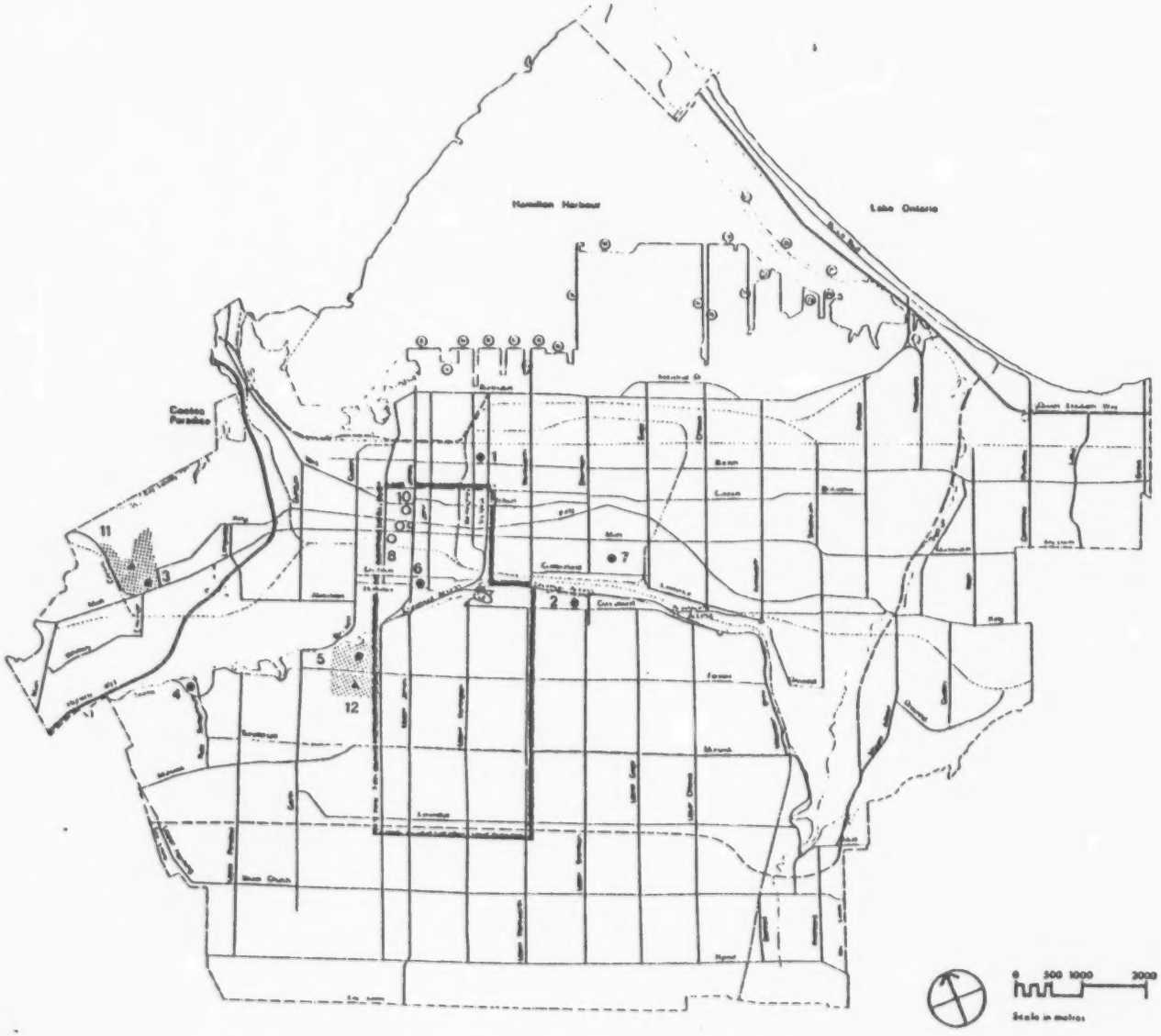
5.3.4 Cultural and Recreation Facilities

Figure 5.5 shows the present location of the most important existing cultural and recreational facilities in Hamilton. The Regional Official Plan, the City Draft Official Plan and the proposed Central Policy Area Plan all contain policies and recommendations to ensure that the downtown Central Policy Area is maintained and reinforced as the centre for major cultural activities including Hamilton Place, the Hamilton Public Library, the Art Gallery of Hamilton, and the Football Hall of Fame are located here.

Stadium/Arena Feasibility Study

The recent Stadium/Arena Feasibility Study (September 1980) recommends that, if funding can be arranged, a new Stadium with a seating capacity of 42 000 be located on the Mountain on a site at the southeast corner of Upper Wentworth Street and Limeridge Road just south of the sub-regional shopping centre. Consideration of potential ICTS service to the proposed Stadium was a factor in the evaluation and selection of the Mountain site. The stadium could be served directly by ICTS.

The same study recommends that the most suitable site for a new Arena/Trade Centre of approximately 15 300 seating capacity would be at the southeast corner of Bay Street and York Street. The potential for direct ICTS service to the preferred site is an attractive possibility from the point of view of increasing transit ridership and markets.



Major Medical, Social Services & Post-Secondary Educational Institutions

Legend

Mountain Corridor

Medical Centres

- ● 1 Hamilton General Hospital
- ● 2 Henderson General Hospital and Mt. Hamilton Hospital
- ● 3 Mc Master University Medical Centre
- ● 4 Chedoke Hospital
- ● 5 Hamilton Psychiatric Hospital
- ● 6 St. Joseph's Hospital
- ● 7 St. Peter's Hospital (Major Chronic Care Hospital in the Region)

Government Offices

- ○ 8 City Hall
- ○ 9 Provincial Government Offices/ Regional Government Offices
- ○ 10 Hamilton Public Library

Post-Secondary Institutions

- ▲ 11 Mc Master University
- ▲ 12 Mohawk College of Applied Arts & Technology

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Hamilton-Wentworth Rapid Transit Project

Figure 5.4 Rapid Transit Rationale

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Major Cultural & Recreational Facilities in Hamilton

Legend

Escarpment Mountain Corridor

1 Hamilton Place
2 Public Library and Market
3 Art Gallery
4 Football Hall of Fame
5 Hamilton Yacht Club
6 Leander Rowing Club
7 Ivor Wynne Stadium
8 McMaster University
9 Arena/Trade Centre Site
10 New Stadium Site

● Existing
○ Proposed

Environmentally Sensitive Areas

A Royal Botanical Gardens
B Hamilton Mountain (Radial Line)
C Hamilton Niagara Escarpment
D Red Hill Creek, King's Forest
E Ancaster Creek Headwater
F Red Hill Creek Marsh, Van Wagner's Marsh
G Felkers Falls & Niagara Escarpment
H Toll Gate Ponds
Conservation Authority Parks
J Confederation Park
K Mount Albion Conservation Area
Golf Courses
L Chedoke Civic Golf Course
M King's Forest
Major Urban Parks
N Gage Park
O Dundurn Park
Cemeteries
P Hamilton Cemetery
Q Mount Hamilton Cemetery

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Hamilton-Wentworth Rapid Transit Project

Figure 5.5 Rapid Transit Rationale

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November 1980

5.3.5 Conclusions

Because of the size of the Mountain corridor catchment area, its central location and the major growth potential, there is a much greater opportunity to serve development and structure new growth in the Mountain Corridor than in the West Hamilton Corridor.

There are also many other opportunities to serve existing, planned and possible future development features by rapid transit in the Mountain Corridor. Most of the major transit terminals are presently located within or adjacent to this Corridor and several new terminals including the new multi-mode transportation terminal can be located here. Many medical and social service institutions could be served as well as Mohawk College. Existing and future major cultural activities as well as the proposed new arena/trade complex will be located in the corridor. Other existing facilities as well as a potential new stadium would benefit from rapid transit in the corridor.

5.4 Regional and City Planning Objectives

5.4.1 1980 Regional Official Plan

The Regional Official Plan contains both general and specific policies giving public transit a high priority in the planning of new transportation facilities in the urban area to produce an integrated and balanced transportation system.

Specific policies are aimed at the development of an urban transit system that is planned and operated in such a manner that:

(i) Downtown Hamilton will be the primary focal point of transit service and the level of service into the downtown area will be such that it will provide a degree of accessibility that is consistent with the role of downtown as a Regional Centre and

that will reduce the need for the operation of private automobiles into the downtown area. (O.P. 9.3.3(a))

(ii) The sub-regional centre on the Hamilton Mountain be a focal point for transit service above the escarpment in Hamilton and Stoney Creek, with a major high speed transit connection between this centre and downtown Hamilton. (O.P. 9.3.3(b))

Additional policies are as follows:

(iii) that the planning of transit routes and intermediate capacity transit lines take into account the location of major activity centres. (O.P. 9.3.7)

(iv) To consider public transit as an integral part in the planning of major new residential development and all new commercial and employment centres in the urbanized portion of the Region. Accordingly, the Area Municipalities shall provide policy guidance through their Official Plans and, where deemed appropriate, secondary plans for such areas shall include provisions for safe, convenient and direct pedestrian access to the public transit system. (O.P. 9.3.10)

(v) To encourage the Area Municipalities to allow for the concentration of high density residential development in the immediate proximity of major transit corridors and transfer points in the transit system, in order that the transit system is immediately available for the use of as many persons as possible. (O.P. 9.3.11)

(vi) To recognize terminal facilities such as...transit stations and parking areas as integral parts of the total transportation system and the existing or planned location of these facilities are recognized in the transportation planning process in order to ensure maximum integration and compatibility with the transportation systems. (O.P. 9.5.1)

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(vii) That in order to encourage the use of public transit and reduce the potential use of private automobiles in the downtown area, the City of Hamilton will be encouraged to adopt as part of its Official Plan, policies that discourage the use of public parking facilities for long-term commuter parking in the downtown area. (O.P. 9.5.9)

5.4.2 Draft Transportation Capital Facilities Plan

The 1980 Draft Transportation Capital Facilities Plan identifies a rapid transit connection between Hamilton Mountain and downtown Hamilton as the only feasible rapid transit line within the planning horizon.

Phase I of the Plan states that the Mountain rapid transit line must be implemented in order to accommodate development in downtown Hamilton and to encourage residential development on the Hamilton Mountain. The timing of the facility is dependent on these two areas and on the availability of financial aid from other levels of government.[1]

In identifying transportation project priority for the Regional Budget Plan Process in Phase II of the Plan, seven road projects were given priority primarily because of their importance in maximizing the availability of lands identified for development by the Official Plan and to the overall performance of the transportation system as a whole.[2]

The analysis and ranking process did not attempt to identify possible land use and development benefits created by earlier implementation of rapid transit. It gave equal emphasis to all development with the proposed staging of the Official Plan. The

1. Draft TCFP, Phase I, Section 3.7.1
2. Draft TCFP, Phase II, Exhibit 4.2

analysis of the relevant Mountain screenlines in Phase II of the Plan estimates that travel demands for escarpment access immediately south of the C.B.D. would exceed the capacity of the existing road and transit system within the next five years, [and that] this area has a high potential for an intermediate capacity transit system capable of attracting in excess of 9 000 transit riders in the peak direction.[1]

The major reasons[2] stated for requiring such a system were as follows:

a) The natural orientation of trips to and from the C.B.D. permit the concentration of demand for escarpment access to an area immediately south of the C.B.D.

b) The Regional Official Plan implies that road improvements across the escarpment between Beckett Drive and the Sherman Access inclusive will be limited to improvements to the existing accesses.

c) Road improvements to existing accesses would add to the capacity of access roads passing through the C.B.D. and contribute to congestion in the downtown area.

5.4.3 City of Hamilton Draft Official Plan

The City Draft Official Plan has recently been updated to conform with Regional Official Plan Policies. The main intent of the Public Transit component is stated as "to provide for an efficient Public Transit system that will meet the future needs of people in the City, and will attract sufficient levels of ridership."[3]

1. Draft TCFP, Phase II, Section 3.3.14.
2. Draft TCFO Phase II Sec 3.3.14
3. City Draft Official Plan B.3.2

Specific policies in this component support the major transit focal points identified by the Region and previously mentioned. With respect to rapid transit the Plan states:

> "To minimize the need for new road facilities in congested corridors and to accommodate large volumes of transit users, Council may consider the potential of a new and innovative intermediate capacity transit line connecting downtown Hamilton to an appropriate location on the Mountain. Accordingly, Council will co-operate with the Region and other levels of government in any studies to determine an appropriate location for the intermediate capacity transit lines..."[1]

At present some of the City's neighbourhood plans provide support for rapid transit oriented development while others, particularly those for established neighbourhoods above the escarpment, would have to be reviewed with route proposals.

5.4.4 Conclusions

Past studies commissioned by the Regional Municipality of Hamilton-Wentworth have established a positive attitude toward the use of public transit and the implementation of rapid transit in the Mountain Corridor. The City also supports public transit and is receptive to the rapid transit proposal.

Preliminary policies to support rapid transit are in place at the Region level.

5.5 Corridor Assessment

On the basis of the comparative evaluation, the Mountain Corridor is clearly the recommended priority corridor for rapid transit in Hamilton. The ridership forecasts are not as dependent on other major transportation decisions as is the case in the West Hamilton Corridor. It offers the best potential for reducing the

1. City of Hamilton Draft Official Plan, 1980, Section 3.2.11

requirement for further road expansion. The degree to which a facility in this corridor could reinforce the current proposals of the long-term development plans for the City also favours its selection.

The development and transportation policies of the Regional Official Plan clearly support implementation of rapid transit in the Mountain Corridor. Table 5.2 summarizes the evaluation of the Mountain and West Hamilton Corridors.

TABLE 5.2

Official Plan Policies	West Corridor	Mountain Corridor
Development		
1. Support CBD as Regional Centre	limited	good
2. Support Mountain Sub-Regional Centre	poor	good
3. Distribution of Employment to Support Public Transit	limited	good
Transportation		
1. Limit Road Improvements Across Escarpment	N/A	good
2. Support Mountain Sub-Regional Centre	poor	good
3. Encourage High Density Residential Development	limited	good
4. Consideration of Activity Centres	fair	good

In absolute terms, it appears clear that a rapid transit facility would reduce the requirement for expansion of roads across the Escarpment. Present trends indicate that encouraging higher transit usage is a positive step in recognizing the need to provide a more energy efficient urban transportation system.

It will be difficult and expensive (in terms of both costs and disruption) to expand the road facilities to accommodate the expected increase in travel. Previous studies[1] have indicated that the introduction of a rapid transit facility in the Mountain Corridor could defer road expenditures totalling between $27 and $38 million (1976 dollars). The deferred road expenditures in the West Hamilton Corridor were estimated between $12 and $25 million (1976 dollars). In addition, the estimated reduction in the operating cost of surface transit was greater in the Mountain Corridor.

No attempt was made to update the estimated cost of the facility as it is so dependent on the alignment selection. Original estimates placed higher capital cost on the West Hamilton Corridor.

The results of the assessment have demonstrated the need for a separate right-of-way transit system in Hamilton given the growth and development options used. The impact of optional growth strategies will only influence the scheduling of the introduction of rapid transit in Hamilton.

The major factor influencing the potential for rapid transit in Hamilton, given the expected growth in population and employment, is the development of a transportation policy which reinforces the objective of encouraging greater use of public transportation. The public transportation system will continue to be focused on the central area to provide the most convenient service for the majority of potential users. A complementary transportation policy could include restricting major road expansion in the corridors leading to the central area, limiting the amount of core area parking available to employees and placing a premium on the use of the parking spaces provided.

1. Recommended Priority Corridor Within The Basic Trunk Network 1976 Table 1.2.

5.6 Study Corridor Boundary

The study corridor boundary as defined by the Region delineates the area within which alignments will, for the most part, be contained. However, the nature of the facility and requirement for ancillary facilities such as maintenance yards and shops may make it necessary to locate some elements of the system beyond the defined corridor limits. Hence the corridor boundary should be treated as a "soft line" which can be crossed if special conditions dictate. The analysis will of course consider an impact area much larger than the corridor.

The corridor limits are as follows:

Within the downtown area, the study corridor is bounded by Bay Street, Cannon Street and Victoria Avenue. This area encompasses the major downtown office, commercial, and retail activity centres. All downtown bus routes pass through this area with transfers between most routes occurring at Gore Park, the centre of the area. The T H & B Railway station and the Bus Terminal are within the boundaries. Potential sites for a new inter-city bus terminal are also included in this area.

On the mountain, the study corridor is bounded by Upper Wentworth Street, West 5th Street and the proposed east-west expressway alignment just south of Limeridge Road. The corridor includes the Sub-Regional Centre (which is a possible terminus for ICTS) and the major arterial roads which are potential candidate rights-of-way for rapid transit alignments in the corridor. The corridor comprises primarily residential development and includes vacant areas with potential for new development.

Other factors considered in selecting this area included existing population and employment densities, high density residential development, retail and commercial development and potential for

growth. Mohawk College and the Provincial Hospital are immediately adjacent to the western boundary and will have an impact on this proposed system.

6. ROLE OF RAPID TRANSIT

6.1 Introduction

Transportation and land use are strongly inter-related. The achievement of the development objectives enunciated in the Official Plan is dependent on providing the level of accessibility necessary to support and promote the desired form and structure. Conversely, the successful implementation of major transit facilities is dependent on introducing and supporting land use and zoning policies in the transportation corridor.

In defining the role that transit should play in the Mountain Corridor, a number of basic factors were considered, including:

- Technology Demonstration
- Development Objectives
- Transportation Service
- Energy Considerations

6.2 Technology Demonstration

The Canadian urban transit industry has become a world leader in the supply of transit equipment and systems. However, studies by the federal Department of Industry, Trade and Commerce (DITC) have indicated that advances in both components and full systems in future will be derived primarily from major systems development programs. The DITC report indicates that the importance of a systems capability and the demonstration of that capability in revenue service cannot be over emphasized as a key element in the industry's ability to penetrate both domestic and international markets.

The technology development phase of the UTDC program is now nearing conclusion. The next major phase is a demonstration project, which would serve the following purposes:

- demonstration of technology and operational capability
- advancement of prototype designs and tooling
- provision of tooling and facilities for production
- development of an advanced competitive industrial team in Canada's private sector, capable of worldwide export of transit systems
- establishment of operational testing and manufacturing competence for revenue service.

The implementation of ICTS in Hamilton-Wentworth could represent the first revenue application of this new technology in Canada.

There are many advanced features in this new technology which make it particularly attractive to an urban environment. The small vehicles, operation strategies, low noise levels, opportunities for urban integration, etc. make it a most attractive mode. At the same time, the fact that this could be the first application introduces some risks that could extend the time required to commission the vehicles for service.

However, recognizing the importance of having a practical application if Canada is to be successful as a country in exporting this high technology system, makes it important to fully support the implementation of the system.

Revenue demonstration systems in major Canadian cities will form the primary market tools for an export marketing program and will represent prominent examples of Canadian industrial and technological capabilities.

6.3 Development Objectives

Conformity with Official Plans

The Regional Official Plan contains strong policies promoting the use of public transit and identifies a major high-speed transit link between the Mountain Sub-Regional Centre and downtown Hamilton as part of the urban transit system objectives. The City of Hamilton Draft Official Plan also promotes transit use and is receptive to the rapid transit proposal.

Catalyst For Growth

Rapid transit in the Mountain Corridor is needed to stimulate growth in the Region and City. Growth objectives for the Region to 2001 are based on a gradual increase in the present population growth rate and improvements in the employment growth rate, particularly in the service sector. The Region must attract new major office development to downtown Hamilton to achieve its objectives. The public sector has already made several commitments to the pursuit of these objectives.

The proposed rapid transit link would support this commitment by:

- improving the accessibility to downtown Hamilton for mountain residents.
- improving traffic conditions and generally establishing more attractive development conditions in the downtown
- showing confidence in the Region's potential to meet its objectives.

Future Planning Options

Rapid Transit in the Mountain Corridor would improve planning options for future development in the Region and City.

It would improve opportunities to structure growth according to existing policy objectives:

(a) to increase the proportion of population growth settling in existing urban areas of the City

(b) to concentrate major office growth in the downtown area and at the sub-regional centres and avoid pressure for office development in industrial parks and other locations

(c) to improve the housing mix by increasing the percentage of apartments and multiple dwellings in existing areas, particularly in the Central Policy Area, and in new growth areas on the escarpment by increasing the attractiveness of these areas as locations for development.

(d) to achieve more energy-efficient development

It would provide the option to build upon existing development objectives to achieve a strong transit-oriented development pattern at stations between the downtown and the sub-regional centre.

6.4 Transportation Service

Transit currently plays an important role in the provision of transportation services between the Mountain and the central business district. The significance of this role is reflected in the Regional Official Plan which states:

> That a transit system with increased transit capacity receive a high priority in transportation planning in the urban areas of the Region, especially in the corridor connecting downtown Hamilton to the sub-regional centre on the Hamilton Mountain.[1]

This policy statement was premised on the fact that the forecasted transit ridership in the corridor could be 8 000 persons per hour in the peak direction by the year 2001. It should be noted, however, that this level of transit ridership was predicated on a rapid transit system on an exclusive right-of-way being in place. The analysis was based on the assumption that without such a facility, the modal split to transit would remain relatively low and congestion would occur in the corridor.

If transportation and land use are going to be supportive of each other, then the rapid transit facility should be looked at as an instrument of regional policy and not something that is used to react to a problem. Hence the timing for implementation is extremely critical.

The previous studies have demonstrated the desirability of a rapid transit facility in the Mountain Corridor in support of transportation service requirements. To date, road improvements have been given a higher priority for implementation because of the need to satisfy development and transportation service requirements in the Region. The land use and development opportunities created by the introduction of a rapid transit facility should be included in any future ranking of major capital projects.

1. Regional Official Plan, 1980 Sec. 9.3.8

6.5 Energy Considerations

Uncertainties relative to the supply and cost of petroleum or fossil fuels make the Intermediate Capacity Transit System proposed by UTDC quite attractive.

Petroleum fuels represent a non-renewable resource that is being depleted at an increasing rate.

ICTS however, is an electrical transit system which therefore provides an opportunity to reduce the current rate of depletion of fossil fuels and to develop an awareness towards energy conservation on a large scale. It also has the distinct advantage of pollution-free operation.

Electrically powered transit systems are reported to be more efficient than automobiles. The energy consumption of Intermediate Capacity Transit Systems is reported to range between 1 200 and 1 400 BTU per seat mile. Automobiles are reported to consume up to 2 200 BTU per seat mile.

Electric power costs per BTU are currently somewhat higher than the costs of petroleum. However, the gap is rapidly narrowing and in view of present trends, it is anticipated that electric powered transit vehicles will be the more ecomonical mode within the near future.

ICTS also has potential energy conservation benefits relative to land use development. As discussed in Section 7.2, it is anticipated that the introduction of ICTS as a revenue demonstration project in Hamilton earlier than otherwise possible will act as a stimulus to the earlier implementation of land development patterns supportive of rapid transit. This includes development of higher density clusters of dwelling units such as apartments, townhouses, etc. which are more energy efficient (in terms of heating) than single family dwellings.

6.6 Implementation Timing

The implementation of ICTS in Hamilton will be based on several factors including development objectives, transportation service, technology demonstration and energy conservation.

From the perspective of transportation service, the implementation timing requirements are dictated primarily by the capacity of the road system plus conventional bus transit to accommodate the travel demand in the corridor. Figure 5.1 indicates the projected growth in travel demand in the Mountain Corridor, and the existing and possible future road capacity dictated principally by two factors:

i) the projected growth in travel demand in the Mountain Corridor

ii) the capacity of the road-based transportation system to move people, by automobile and by bus, assuming a realistically achievable modal split by transit.

The potential implementation dates vary depending on the assumed modal split to transit and on the extent to which road capacity is expected to be improved in the corridor. The capacity of the road system is expressed in terms of Level of Service (L.O.S.). Levels of service A to C represent a range from free-flow, low volume traffic conditions to stable flow under moderate volumes. Under L.O.S. 'D' conditions, traffic flow becomes increasingly restricted and approaches unstable flow. L.O.S. 'E' represents capacity conditions at which the traffic volume is the maximum which can be accommodated by the road section or intersection. At L.O.S. 'D" the traffic volumes represent approximately 90% of capacity.

A strong argument can be made for implementation of an alternative to the road-based transportation system, such as ICTS, at a point in time prior to serious congestion of the road-based system. The upper limit of L.O.S. 'D' operations on the road system is therefore a realistic target date for implementation.

Table 6.1 summarizes the range of target implementation dates for both L.O.S. 'D' and L.O.S. 'E', based on the existing road capacity, as well as the capacity under two road improvement scenarios. With existing road capacity, the projected growth in Mountain Corridor travel demand could result in L.O.S. 'D' operations on the road system as early as the period 1986 - 1988. According to current estimates, implementation of ICTS in the Mountain Corridor would require 4 - 5 years from the time of the decision to commence. Therefore assuming a decision to proceed during 1981, the earliest operational date would be 1985 - 86.

If road improvements are made in the corridor, or if it is determined that a lower level of service on the road system will be tolerated prior to implementation of ICTS, the target dates would change as indicated in Table 6.1.

TABLE 6.1

TARGET DATE FOR IMPLEMENTATION OF
RAPID TRANSIT SERVICE IN THE MOUNTAIN CORRIDOR[1]

Capacity (Vehicle Trips Per Hour)	Level of Service	V/C[2]	Target Date
7 100 Existing	D	0.9	1986 - 1988
	E	1.0	1988 - 1992
7 475 (Assumes Improvements to Sherman Access)	D	0.9	1987 - 1989
	E	1.0	1989 - 1994
8 575 (Assumes Improvements to Sherman Access and to escarpment access routes)	D	0.9	1989 - 1996
	E	1.0	1993 - 2001+

1. Derived from Fig. 5.1
2. Volume to Capacity Ratio

On the basis of land use and development objectives an "early" implementation of ICTS has many advantages. Such a system is clearly supported by the objectives of the Official Plans of both the Region and City (Draft).

The potential benefits of the revenue demonstration project to the City and Region can be summarized as follows:

1. The early construction of a fixed facility of this magnitude in downtown Hamilton would exhibit public sector confidence in the downtown's ability to attract new office development at a time when it is most urgently needed. It would also spur other actions such as the Business Promotion Committee and Central Area Plan Advisory Committee in their objectives to promote and improve the appearance of the downtown area.

2. Early construction would provide a strong transit-oriented development option for the Mountain Corridor and downtown area at a time when growth rates in the Region are expected to accelerate. This option could generate substantial benefits to the Region in terms of achieving many of its development policies and in producing a more efficient development form for the Region.

3. A commitment to the early construction of ICTS would improve the decision making capabilities for the location of the proposed new multi-mode terminal downtown as well as the proposed arena and stadium. It could also improve opportunities to find the necessary financial support for these facilities.

An early completion of the project is critical if the Federal and Provincial objectives of having a demonstration of the ICTS technology in revenue service are to be achieved.

Appendix

APPENDIX 'A'

PREVIOUS STUDIES AND REPORTS

1. OFFICIAL PLANS

a) The Regional Municipality of Hamilton-Wentworth

June, 1980 - Regional Planning Department

b) Town of Ancaster Official Plan

June, 1978 - Town of Ancaster

c) Official Plan for the Township of Glanbrook

June, 1977 - Township of Glanbrook

Ongoing studies:

d) Draft Official Plan for the City of Hamilton.

e) Official Plan for the Town of Dundas.

f) Official Plan for the Township of Flamborough.

2. TRANSPORTATION SUBSTUDIES OF THE REGIONAL OFFICIAL PLAN:

a) Report 1 - Inventory

October 1975 - Regional Planning Department

b) Report 2 - Travel Characteristics Survey

October 1975 - Regional Planning Department

c) Report - Development of a Travel Forecasting Model

October 1976 - Regional Planning Department

d) Report 4 - Transportation Impacts of Development Alternatives

October 1976 - Regional Planning Department

e) Report 5 - External Travel Impacts Study

December 1978 - Regional Planning Department

f) Report - Draft Transportation Capital Facilities Plan
Phase I, Phase II

- December 1979
- June 1980

3. SYSTEMS STUDIES

a) Hamilton Area Transportation Plan

May 1963 - City of Hamilton, C.C. Parker and Parsons, Brinckerkoff Limited

b) Hamilton Transportation Strategy Study

June 1973 - Traffic Department, City of Hamilton

4. ROAD NEEDS STUDIES

a) Road Needs Study, County of Wentworth

February 1971 - Wentworth County, and W.L. Sears and Associates

b) Regional Roads Study - Progress Report 2

April 1975 - Regional Engineering

c) City of Hamilton 1978-1988 Road Needs Study

1977 - City of Hamilton

d) Urban Roads and Services Programming Study, 1970-1980

November 1970 - Township of Saltfleet and Damas and Smith

5. ENGINEERING AND ROUTE FEASIBILITY STUDIES

a) Hamilton Perimeter Industrial Road Feasibility Study

November 1977 - Engineering Departments of Region and Hamilton

b) Reconstruction of Burlington Street - Woodward Avenue to Kenilworth

June 1978 - Regional Engineering

c) Mountain East-West and North-South Corridor Study
Phase 3 - Detailed Impact Assessment and Evaluation

August 1979 - Hamilton-Wentworth Region, DeLeuw Cather (Delcan) and IBI

d) Civic Square Urban Renewal Scheme

October 1965 - City of Hamilton

e) York Street Urban Renewal Scheme

May 1966 - Hamilton and Murray V. Jones and Associates

f) Reconstruction of Deck, Longwood Bridge

October 1968 - Hamilton and C.C. Parker

g) Functional Planning Report - Charlton Avenue

1970

h) Barton Street Feasibility Study - Saltfleet Township

1971

i) Fruitland Road Extension Feasibility Study

1971

j) Highway 403 Extension Study

M.T.C.

k) Niagara Escarpment Scenic Drive Feasibility Study

1976

6. TRAFFIC AND TRANSPORTATION STUDIES

a) A Land Use and Transportation Study of Highway 8 Stoney Creek

October 1975 - Stoney Creek

b) A Land Use and Transportation Study - Highway 6, Glanbrook

December 1975

c) Transportation Impacts Study - Saltfleet Community Development

June 1976 - Hamilton-Wentworth Region

d) Traffic Management Systems Study

Hamilton Traffic Department

e) Proposed Underground Parking Facilities - Convention Centre

1971

f) King Street Mall

1972

g) Central Area Transportation Plan

1978 and on-going Central Area Plan

h) Saltfleet Community Development Arterial Road Network

1975

i) Core Area Study

1978, Town of Dundas and A.J. Diamond

j) Bikeways Hamilton

1973 and on-going by Regional Eng.

7. TRUCK STUDIES

a) Hamilton Truck Origin and Destination Study

July 1973 - Hamilton Traffic Department

b) Truck Route System for Stoney Creek

May 1975 - Hamilton Traffic Department

8. TRANSIT STUDIES

a) Wentworth-Burlington Suburban Bus Study

1971 - Wentworth and Burlington

b) Hamilton Transit Study

June 1973 - City of Hamilton and H.S.R.

c) Hamilton-Wentworth Regional Transit Assumption Study

November 1974 - Hamilton-Wentworth Region and H.S.R.

d) Public Transportation Feasibility Study - Saltfleet Community

November 1975 - Hamilton-Wentworth Region

e) Town of Stoney Creek Public Transit Investigation

May 1978 - Stoney Creek and DeLeuw Cather

f) Inter-Regional Bus Transit Study - Oakville to Hamilton

March 1978 - M.T.C.

g) Q.E.W. Corridor Transit Study

1975

h) Transportation for the Handicapped and Aged

June 1975 - Hamilton-Wentworth Region

i) Dial-A-Bus

1974

j) H.S.R. Maintenance Facilities Study

1979 - DeLeuw Cather

9. RAPID TRANSIT STUDIES

a) City of Hamilton Official Plan - Rapid Transit Study

1970 - Hamilton Planning Department

b) Hamilton Rapid Transit Network - A Discussion of Potential I.C.T.S. Routes in Hamilton

November 1975 - Urban Transportation Development Corporation

c) Hamilton Rapid Transit Development Program - Recommended Priority Corridor Within the Basic Trunk Network

September 1976 - City of Hamilton and Transit Community

d) A Study of Existing Rights of-Way for Intermediate Capacity Transit Application in Canadian Cities - Hamilton

March 1976 - Transportation Development Agency

e) U.T.D.C. Urban Design Study

October 1978 - U.T.D.C.

f) Hamilton Area Rapid Transit Study Physical Feasibility

July 1970 - Hamilton Transit Com. and DeLeuw Cather

10. HARBOUR STUDIES

a) Draft Official Plan for Hamilton Harbour - OPA #318

March 1977 - City of Hamilton and Regional Planning

b) Hamilton Harbour Port Master Plan

June 1978 - Hamilton Harbour Commissioners and Planistics

c) Hamilton-Wentworth Waterfront Study

1973

11. AREA STUDIES

a) Metropolitan Toronto and Region Transportation Study (MTARTS)

November 1967 - Ontario Ministry of Municipal Affairs and Community Planning.

b) Niagara-Lake Erie Transportation Study (NLETS)

May 1976 - M.T.C.

c) Metro Plan

1979 - Metropolitan Toronto Planning Department.